

34
1

METEOROLOGICAL OBSERVATIONS

MADE IN

MONTGOMERY COUNTY,

SOUTHERN OHIO,

AND A

CONDENSED TREATISE

ON

METEOROLOGY IN GENERAL.

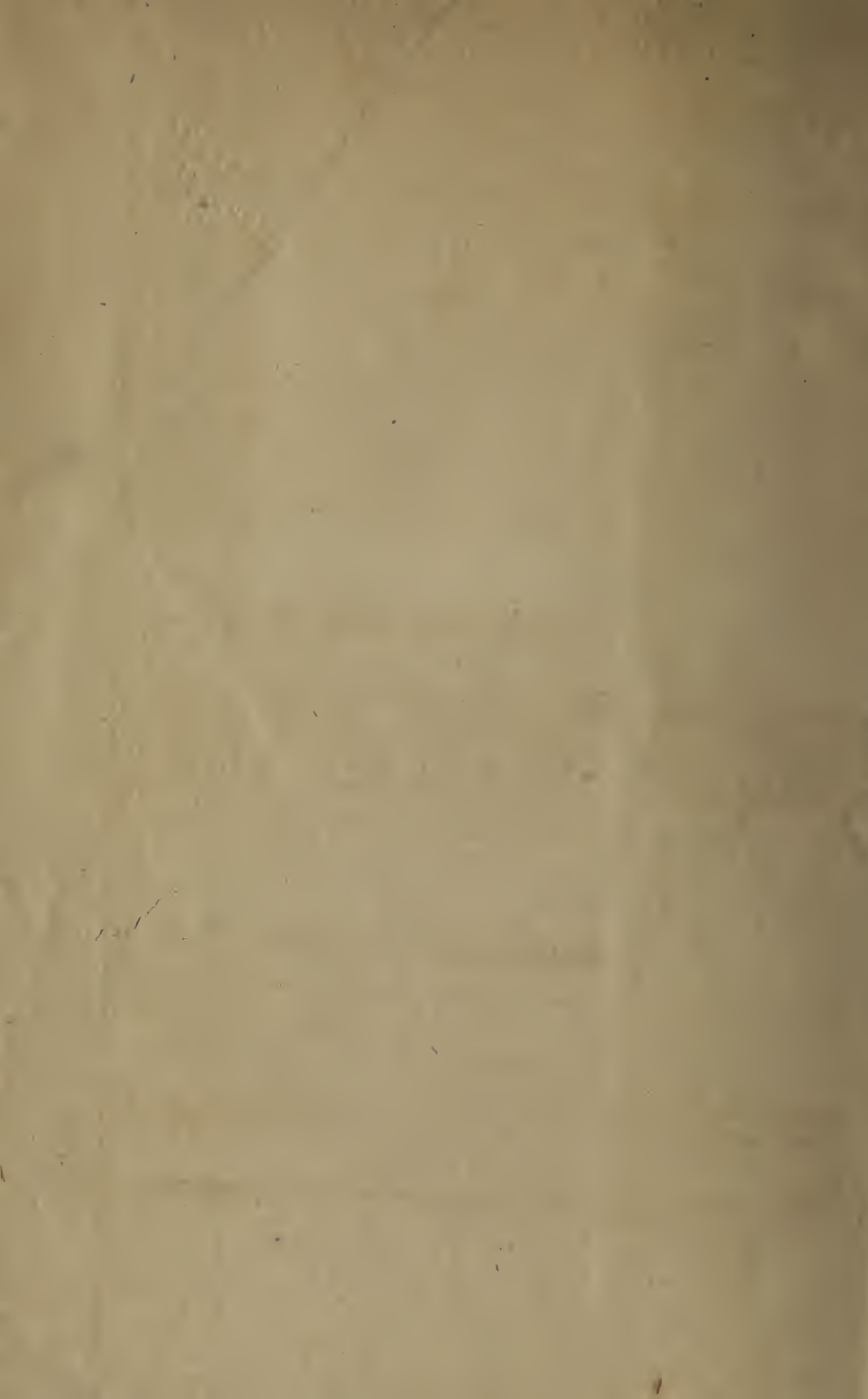
BY L. GRONEWEG,

PRACTICAL AND ANALYTICAL CHEMIST, MEMBER OF THE AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE, AND METEOROLOGICAL OBSERVER FOR
THE SMITHSONIAN INSTITUTION.

GERMANTOWN:

PUBLISHED BY THE AUTHOR.

1856.



551.5
989m

20774-188
20180110

				45.27	59.94	49.29	86	59	81
94	209.52	8.946	12	29.15	39.57	31.85	87	66	83
50	9.00	7.298	2	43.92	61.17	49.92	80	49	70
60	0.00	10.720	0	63.80	78.57	66.80	90	61	88
00	117.60	6.570	6	44.22	60.42	48.57	87	58	84

LDDEST DAY.

		Date.
Warmest day .....	.....	26th July.
Coldest day .....	.....	30th January.
Range .....	.....	

44883

TABLE I.

METEOROLOGICAL OBSERVATIONS,

MADE AT GERMANTOWN, MONTGOMERY COUNTY, OHIO.

FOR THE METEOROLOGICAL YEAR 1850-'51, BY L. GRONEWEG.

	BAROMETER. Corrected and reduced to the Freezing Point, or 32 deg. Fahrenheit, <i>English Inches.</i>				Open Air Thermometer, Fahrenheit.				Clear- ness of the Sky. Month- ly Means.	Wind, Directions, Monthly means.	Quantity of Rain and Melted Snow. Paris Cubic Inch.		Perpendicular depth of Rain and Melted Snow.		Rela- tive Hu- midity. M'th- ly m's Per ct.	Force of Vapor. Monthly Means.		No. thunder storms.	Number of Days, with						Mean Temperature.			Relative Hu- midity. Per cent.				
	Monthly Mean.	Maximum.	Minimum.	Vari- ations.	Monthly Means.	Maximum.	Minimum.	Vari- ations.			Rain.	Melted Snow.	Paris Inches.	English Inches.		Paris Lines.	English Inches.		Heat Light- nings.	Dew.	Froz'n Dew.	Dry Mist.	Fog & Mist.	Rain.	Snow.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	
1850.																																
December, 1851.	29.346	29.675	28.520	1.155	30.65	62.15	2.97	59.18	6.8	E: W=1: 9.17. N: S=1: 0.61	233.40	131.56	2.534	2.701	81	1.63	0.1421	0	0	0	5		1	10	6	27.27	36.05	28.62	86	70	86	
January, .	29.293	29.977	28.716	1.261	31.55	58.55	-7.37	65.92	5.5	E: W=1: 59.00. N: S=1: 1.13	94.16	1.00	0.658	0.691	75	1.60	0.1421	0	0	0	11	7	6	1	26.37	38.97	29.75	85	61	79		
February, .	29.337	29.835	28.787	1.048	38.50	63.50	8.15	55.35	7.1	E: W=1: 7.17. N: S=1: 1.89	751.38	76.96	5.754	6.134	80	2.22	0.1954	0	0	0	6	6	10	5	33.80	43.70	37.17	89	68	83		
March, . .	29.266	29.568	28.955	0.631	43.25	73.17	15.80	57.37	4.8	E: W=1: 8.17. N: S=1: 1.48	341.60	9.00	2.434	2.595	69	2.22	0.1954	3	1	4	6	3	9	2	35.82	52.47	41.45	79	54	73		
April, . . .	29.151	29.684	28.565	1.119	48.87	73.40	26.82	46.58	5.5	E: W=1: 4.00. N: S=1: 1.00	336.86	0.00	2.336	2.490	63	2.34	0.2043	1	1	4	6	3	11	0	41.22	57.87	47.30	81	44	64		
May, . . .	29.222	29.542	28.875	0.667	63.05	89.82	20.75	69.07	5.2	E: W=1: 2.75. N: S=1: 5.89	364.04	0.00	2.528	2.694	68	4.55	0.4085	9	5	13	4	5	12	0	54.72	73.17	61.02	80	49	74		
June, . . .	29.168	29.470	28.724	0.746	67.55	88.70	46.17	42.53	6.0	E: W=1: 3.29. N: S=1: 8.50	380.20	0.00	2.640	2.814	79	6.04	0.5329	9	0	9	0	2	10	0	61.70	75.65	65.30	89	63	84		
July, . . .	29.177	29.373	29.000	0.373	71.82	91.40	47.07	44.33	4.6	E: W=1: 3.43. N: S=1: 2.87	790.40	0.00	5.502	5.865	79	6.89	0.6128	14	5	22	0	4	12	0	66.20	80.82	68.22	91	57	90		
August, . .	29.231	29.462	28.964	0.498	69.80	86.00	43.92	42.08	3.7	E: W=1: 2.39. N: S=1: 2.10	374.00	0.00	2.598	2.769	81	6.57	0.5862	5	4	26	0	12	8	0	63.50	79.25	66.87	91	62	91		
September, .	29.319	29.648	29.026	0.622	65.30	94.32	30.87	63.45	3.3	E: W=1: 1.38. N: S=1: 1.95	159.20	0.00	1.104	1.177	74	5.19	0.4618	0	1	18	1	17	3	0	57.42	77.90	61.02	89	47	85		
October, . .	29.195	29.577	28.733	0.844	50.22	78.35	17.37	60.98	4.7	E: W=1: 2.69. N: S=1: 2.96	327.20	8.00	2.326	2.480	75	3.06	0.2753	0	0	9	6	19	7	1	41.90	60.57	48.20	87	56	83		
November, .	29.213	29.684	28.680	1.004	37.62	86.90	17.37	51.53	7.7	E: W=1: 1.64. N: S=1: 1.00	242.60	209.60	3.140	3.347	80	2.13	0.1865	2	0	0	2	10	8	5	33.35	42.80	36.50	85	71	84		
Sums, . . .											4395.04	436.12	33.534	35.747				48	17	105	47		89	106	20							
Means of the Year, . .	29.243				51.498				5.4	E: W=1: 8.77. N: S=1: 2.61					75	3.705	0.3286									45.27	59.94	49.29	86	59	81	
SEASONS.																																
Winter, . .	29.328	29.977	28.520	1.457	33.57	63.50	-7.37	70.87	6.5	E: W=1: 25.113. N: S=1: 1.21	1078.94	209.52	8.946	9.526	79	1.82	0.1599	0	0	0	22	14	26	12	29.15	39.57	31.85	87	66	83		
Spring, . .	29.213	29.684	28.565	1.119	51.80	89.82	15.80	74.02	5.2	E: W=1: 4.97. N: S=1: 2.79	1042.50	9.00	7.298	7.779	67	3.04	0.2664	13	7	21	16	11	32	2	43.92	61.17	49.92	80	49	70		
Summer, . .	29.195	29.470	28.724	0.746	69.80	91.40	43.92	47.48	4.8	E: W=1: 3.04. N: S=1: 4.49	1544.60	0.00	10.720	11.448	80	6.51	0.5773	28	9	57	0	18	30	0	63.80	78.57	66.80	90	61	88		
Autumn, . .	29.240	29.684	28.680	1.004	51.12	94.32	17.37	76.95	5.2	E: W=1: 1.903. N: S=1: 1.97	729.00	117.60	6.570	7.004	76	3.46	0.3108	2	1	27	9	46	18	6	44.22	60.42	48.57	87	58	84		

YEARLY EXTREMES.

	Maximum.	Date.	Minimum.	Date.	Range.
Barometer—English Inches	29.977	31st January, 1851	28.520	22d December, 1850	1.457
Thermometer—Fahrenheit	94.32°	11th September	-7.37°	31st January, 1851	101.69
Thermometer—Reaumur	27.7°	"	-17.5°	"	45.2

MEAN TEMPERATURE OF THE WARMEST AND COLDEST DAY.

	Fahrenheit.	Reaumur.	Date.
Warmest day	81.05°	21.8	26th July.
Coldest day	3.87°	-12.5	30th January.
Range	77.18	34.3	

8	365.2	9.006	23.22	33.27	26.30	88	70	81
8	9.8	9.756	43.92	58.25	47.97	83	56	76
4	0.0	4.982	62.00	80.00	66.12	90	54	84
4	14.6	8.650	46.17	60.42	48.80	92	63	89

ST DAY.

Date.

Warmest day..... 23d July.
Coldest day 19th January.
Range

TABLE II.

METEOROLOGICAL OBSERVATIONS,

MADE AT GERMANTOWN, MONTGOMERY COUNTY, OHIO.

FOR THE METEOROLOGICAL YEAR 1851-'52, BY L. GRONEWEG.

	BAROMETER.				Open Air Thermometer, Fahrenheit.				Clear- ness of the Sky. Month- ly Means.	Wind, Directions, Monthly means.		Quantity of Rain and Melted Snow.		Perpendicular depth of Rain and Melted Snow.		Rela- tive Hu- midi- ty. M'th- ly m's Per cent.	Force of Vapor.		No. thunder storms.	Number of Days, with						Mean Temperature.			Relative Hu- midity. Per cent.				
	Corrected and reduced to the Freezing Point, or 32 deg. Fahrenheit, English Inches.		Monthly Means.									Rain.	Melted Snow.	Paris Inches.	English Inches.		Paris Lines.	English Inches.															
	Monthly Mean.	Maximum.	Minimum.	Vari- ations.	Monthly Means.	Maximum.	Minimum.	Vari- ations.		Rain.	Melted Snow.	Paris Inches.	English Inches.	Paris Lines.	English Inches.		Heat Light- nings.	Dew.		Froz'n Dew.	Dry Mist.	Fog & Mist.	Rain.	Snow.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.			
1851.																																	
December,	29.319	29.737	28.733	1.004	26.15	61.25	-22.90	84.15	7.2	E: W=1: 2.11. N: S=1: 2.81	355.4	81.2	3.032	3.232	81	1.49	0.1332	1	0	0	5	0	5	7	3	22.10	31.77	24.57	93	74	83		
1852.																																	
January, .	29.222	29.817	28.547	1.270	23.00	57.20	-31.45	88.65	7.1	E: W=1: 1.69. N: S=1: 2.00	103.4	243.6	2.410	2.569	81	1.27	0.1155	0	0	0	2	0	10	5	10	18.50	29.07	21.42	91	72	85		
February, .	29.168	29.719	28.627	1.092	33.57	54.95	5.22	49.73	6.7	E: W=1: 2.67. N: S=1: 1.85	473.0	40.4	3.564	3.799	72	1.56	0.1421	0	0	0	2	0	7	6	4	29.07	38.97	32.90	79	63	75		
March, . .	29.142	29.746	28.280	1.466	42.57	77.90	6.35	71.55	7.0	E: W=1: 1.52. N: S=1: 1.31	356.6	9.0	2.478	2.641	71	2.31	0.2043	3	0	0	4	6	5	12	4	38.30	49.32	40.55	81	60	69		
April, . . .	28.982	29.391	28.414	0.977	46.62	83.97	21.42	62.55	6.7	E: W=1: 2.50. N: S=1: 1.70	636.6	0.8	4.414	4.705	73	2.62	0.2309	6	0	2	6	4	9	15	1	40.10	54.95	44.82	82	56	80		
May, . . .	29.204	29.559	28.867	0.692	60.80	82.40	28.17	54.23	6.0	E: W=1: 2.11. N: S=1: 2.35	412.6	0.0	2.864	3.053	72	4.40	0.3908	7	4	11	3	2	10	15	0	53.37	70.47	58.55	86	52	79		
June, . . .	29.195	29.533	28.813	0.720	65.52	88.25	37.17	51.08	5.0	E: W=1: 2.56. N: S=1: 2.00	315.4	0.0	2.186	2.330	79	5.58	0.4974	9	6	20	0	0	10	12	0	59.00	75.87	62.60	91	58	87		
July, . . .	29.213	29.444	28.920	0.524	73.40	94.55	43.25	51.30	4.0	E: W=1: 2.53. N: S=1: 1.00	208.2	0.0	1.454	1.550	74	6.62	0.5862	13	9	22	0	1	6	11	0	66.20	84.20	69.57	89	50	83		
August, . .	29.177	29.470	28.911	0.559	68.90	85.32	41.67	43.65	5.2	E: W=1: 1.00. N: S=1: 2.00	193.8	0.0	1.342	1.431	76	5.84	0.5151	5	2	16	0	0	17	12	0	60.80	79.92	66.20	91	53	83		
September,	29.266	29.488	28.858	0.630	61.70	87.57	31.32	56.25	5.5	E: W=1: 1.00. N: S=1: 4.09	377.2	0.0	2.614	2.787	82	5.01	0.4441	6	2	9	1	2	16	14	0	54.27	72.05	57.87	94	61	90		
October, . .	29.257	29.479	28.902	0.577	56.30	80.15	26.37	53.78	5.6	E: W=1: 1.52. N: S=1: 2.00	336.0	0.0	2.332	2.486	80	4.01	0.3553	1	2	11	6	9	13	10	0	50.00	66.42	52.47	93	58	91		
November,	29.213	29.684	28.689	0.995	37.62	66.20	15.35	50.85	8.0	E: W=1: 1.89. N: S=1: 1.00	519.2	14.6	3.704	3.948	81	2.19	0.1954	0	0	0	7	0	2	14	6	34.25	42.80	36.05	88	70	85		
Sums, . . .											4287.4	389.6	32.394	34.532				51	25	91	36	24	110	133	28								
Mean of the Year, . .	29.196				49.68				6.2	E: W=1: 1.925. N: S=1: 2.009					77	3.575	0.3197									43.83	57.98	47.30	88	61	83		
SEASONS.																																	
Winter, . .	29.240	29.817	28.547	1.270	27.50	61.25	-31.45	92.70	7.0	E: W=1: 2.16. N: S=1: 2.22	931.8	365.2	9.006	9.600	78	1.439	0.1243	1	0	0	9	0	22	18	17	23.22	33.27	26.30	88	70	81		
Spring, . .	29.090	29.746	28.280	1.466	50.00	83.97	6.35	77.62	6.6	E: W=1: 2.06. N: S=1: 1.79	1405.8	9.8	9.756	10.399	72	3.110	0.2753	16	4	13	13	12	24	42	5	43.92	58.25	47.97	83	56	76		
Summer, . .	29.195	29.533	28.813	0.720	69.12	94.55	37.17	57.38	4.7	E: W=1: 2.03. N: S=1: 1.67	717.4	0.0	4.982	5.311	76	6.014	0.5329	27	17	58	0	1	33	35	0	62.00	80.00	66.12	90	54	84		
Autumn, . .	29.248	29.684	28.689	0.995	51.80	87.57	15.35	72.22	6.4	E: W=1: 1.47. N: S=1: 2.36	1232.4	14.6	8.650	9.221	81	3.737	0.3286	7	4	20	14	11	31	38	6	46.17	60.42	48.80	92	63	89		

YEARLY EXTREMES.

	Maximum.	Date.	Minimum.	Date.	Range.
Barometer—English Inches	29.817	19th January, 1852	28.280	24th March	1.537
Thermometer—Fahrenheit	94.55	23d July	-31.45	20th January	126.00
Thermometer—Reaumur	27.8	“	-28.2	“	56.0

MEAN TEMPERATURE OF THE WARMEST AND COLDEST DAY.

	Fahrenheit.	Reaumur.	Date.
Warmest day	81.27	21.9	23d July.
Coldest day	-13.67	-20.3	19th January.
Range	94.94	42.2	

		46.53	60.31	48.88	85	58	82
1664.8	193.8	28.47	38.75	32.15	88	71	85
785.6	53.4	44.75	58.25	48.57	79	52	74
1280.2	0.0	67.84	83.75	69.05	82	49	81
1006.6	0.0	45.05	60.50	49.10	91	62	86

kes of Snow.

EST DAY.

Range.			Date.
1.501	Warmest		30th June.
11.59	Coldest da		9th February.
49.6	Range		

TABLE III.

METEOROLOGICAL OBSERVATIONS,

MADE AT GERMANTOWN, MONTGOMERY COUNTY, OHIO.

FOR THE METEOROLOGICAL YEAR 1852-'53, BY L. GRONEWEG.

	BAROMETER.				Open Air Thermometer, Fahrenheit.				Clear- ness of the Sky. Month- ly Means.	Wind, Directions, Monthly means.	Quantity of Rain and Melted Snow. Paris Cubic Inch.		Perpendicular depth of Rain and Melted Snow.		Rela- tive Hu- midi- ty. M'th- ly m's Pr ct.	Force of Vapor. Monthly Means.		No. thunder storms.	Number of Days, with								Mean Temperature.			Relative Hu- midity. Per cent.			
	Corrected and reduced to the Freezing Point, or 32 deg. Fahrenheit, English Inches.	Maximum.	Minimum.	Vari- ations.	Monthly Means.	Maximum.	Minimum.	Vari- ations.			Rain.	Melted Snow.	Paris Inches.	English Inches.		Paris Lines.	English Inches.		Heat Light- nings.	Dew.	Froz'n Dew.	Dry Mist.	Fog & Mist.	Rain.	Snow.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.		
1852.																																	
December, 1853.	29.177	29.639	28.565	1.074	36.27	59.45	9.72	49.73	7.26	E: W=1: 1.41. N: S=1: 4.60	1332.2	2.2	9.266	9.878	82	2.087	0.1865	2	1	0	7	0	6	12	3	32.00	41.22	35.60	88	74	84		
January, .	29.284	29.808	28.307	1.501	31.55	56.30	3.87	52.43	5.99	E: W=1: 1.30. N: S=1: 1.35	97.0	47.6	1.004	1.070	80	1.561	0.1421	0	0	0	11	0	4	6	7	27.27	37.40	29.97	89	69	84		
February, .	29.186	29.666	28.742	0.924	30.87	54.27	-14.12	68.39	6.95	E: W=1: 2.90. N: S=1: 2.06	235.6	144.0	2.836	3.023	81	1.650	0.1510	1	0	0	7	0	5	6	4	26.15	37.62	30.87	87	69	86		
March, . .	29.186	29.639	28.707	0.932	38.52	69.80	9.72	60.08	6.34	E: W=1: 2.69. N: S=1: 1.52	170.2	53.4	1.552	1.654	72	1.905	0.1687	1	0	0	7	7	6	5	4	32.67	44.60	38.30	84	55	75		
April, . . .	29.168	29.497	28.751	0.746	51.80	78.57	21.20	57.37	5.67	E: W=1: 1.30. N: S=1: 1.35	422.6	0.0	2.934	3.128	68	2.854	0.2576	8	2	2	6	6	3	12	0	46.17	59.67	49.32	76	52	74		
May, . . .	29.201	29.453	28.884	0.569	61.25	89.60	28.85	60.75	4.99	E: W=1: 2.31. N: S=1: 2.28	192.8	0.0	1.338	1.426	66	4.066	0.3641	7	5	11	4	2	2	12	0	55.40	70.47	58.10	77	48	73		
June, . . .	29.248	29.479	29.035	0.444	76.10	97.47	41.00	56.47	3.64	E: W=1: 3.00. N: S=1: 4.45	209.4	0.0	1.454	1.550	65	6.382	0.5684	10	6	20	0	1	2	8	0	70.02	87.35	70.92	76	41	78		
July, . . .	29.240	29.417	28.973	0.444	72.72	92.97	45.05	47.92	4.89	E: W=1: 0.53. N: S=1: 1.19	478.2	0.0	3.320	3.539	68	5.993	0.5329	4	3	17	0	2	1	5	0	67.55	82.40	68.22	79	48	77		
August, . .	29.195	29.524	29.000	0.524	71.82	92.75	46.85	45.90	4.32	E: W=1: 2.92. N: S=1: 2.29	592.6	0.0	4.116	4.388	79	6.777	0.6039	10	6	19	0	0	8	12	0	65.97	81.50	68.00	90	57	89		
September, .	29.248	29.488	28.840	0.648	63.50	86.45	37.62	48.83	5.13	E: W=1: 1.23. N: S=1: 1.61	335.8	0.0	2.332	2.486	82	5.545	0.4885	5	2	14	0	1	12	8	0	57.42	72.27	61.25	94	64	89		
October, . .	29.257	29.595	28.689	0.906	46.62	72.05	26.82	45.23	4.52	E: W=1: 2.07. N: S=1: 2.26	313.8	0.0	2.178	2.322	78	2.737	0.2398	1	0	2	18	7	7	6	0	38.07	57.87	43.47	93	56	84		
November, .	29.373	29.737	28.964	0.773	44.60	67.77	22.32	45.45	6.50	E: W=1: 1.00. N: S=1: 2.53	357.0	0.0	2.404	2.563	79	2.757	0.2487	0	0	2	9	9	7	9	10	39.65	51.35	42.57	87	65	85		
Suns, . . .											4737.2	247.2	34.734	37.027				49	25	87	69	35	63	101	19								
Mean of the Year, . .	29.2305				52.135				5.517	E: W=1: 1.888. N: S=1: 2.290					75	3.684	0.32935									46.53	60.31	48.88	85	58	82		
SEASONS.																																	
Winter, . .	29.216	29.808	28.307	1.501	32.897	59.45	-14.12	73.57	6.73	E: W=1: 1.87. N: S=1: 2.67	1664.8	193.8	13.106	13.971	81	1.766	0.1599	3	1	0	25	0	15	24	14	28.47	38.75	32.15	88	71	85		
Spring, . .	29.186	29.639	28.707	0.932	50.523	89.60	9.72	79.88	5.67	E: W=1: 2.10. N: S=1: 1.72	785.6	53.4	5.824	6.208	69	2.942	0.2635	16	6	13	17	15	11	29	4	44.75	58.25	48.57	79	52	74		
Summer, . .	29.228	29.524	28.973	0.651	73.547	97.47	41.00	56.47	4.28	E: W=1: 2.15. N: S=1: 2.64	1280.2	0.0	8.890	9.477	71	6.348	0.5684	24	15	56	0	3	11	25	0	67.84	83.75	69.05	82	49	81		
Autumn, . .	29.293	29.737	28.689	1.048	51.573	86.45	22.32	64.13	5.38	E: W=1: 1.43. N: S=1: 2.13	1006.6	0.0	6.914	7.371	80	3.680	0.3257	6	2	18	27	17	26	23	1	45.05	60.50	49.10	91	62	86		

° Small Flakes of Snow.

YEARLY EXTREMES.

	Maximum.	Date.	Minimum.	Date.	Range.
Barometer—English Inches	29.808	28th January, 1853	28.307	23d January	1.501
Thermometer—Fahrenheit	97.47	20th June	-14.12	9th February	111.59
Thermometer—Reaumur	29.1	"	-20.5	"	49.6

MEAN TEMPERATURE OF THE WARMEST AND COLDEST DAY.

	Fahrenheit.	Reaumur.	Dato.
Warmest day	83.07	22.70	30th June.
Coldest day	2.50	-13.13	9th February.
Range	80.57	35.83	

			47.35	61.45	50.11	85	56	81
2.783	1055.02	14	26.60	36.72	29.00	86	65	81
2.39	2784.18	4	46.32	60.12	49.17	82	53	78
2.43	904.05	0	68.67	84.87	69.95	84	50	84
1.38	986.05	1	47.82	64.10	52.32	88	57	83

LDEST DAY.

Range.	r.	Date.
... 1.492		 30th July.
... 109.34		 23d January.
... 48.6		

TABLE IV.

METEOROLOGICAL OBSERVATIONS,

MADE AT GERMANTOWN, MONTGOMERY COUNTY, OHIO.

FOR THE METEOROLOGICAL YEAR 1853-'54, BY L. GRONEWEG.

	BAROMETER. Corrected and reduced to the Freezing Point, or 32 deg. Fahrenheit, English Inches.				Open Air Thermometer, Fahrenheit.				Clear- ness of the Sky. Month- ly Means.	Wind, Direction, Monthly means.		Quantity of Rain and Melted Snow. Paris Cubic Inch.		Perpendicular depth of Rain and Melted Suow.		Rela- tive Hu- midi- ty. M'th- lym's Pr ct.	Force of Vapor. Monthly Means.		No. thunder storms.	Number of Days, with								Mean Temperature.			Relative Hu- midity. Per cent.		
	Monthly Means.	Maximum.	Minimum.	Vari- ations.	Monthly Means.	Maximum.	Minimum.	Vari- ations.				Rain.	Melted Snow.	Paris Inches.	English Inches.		Paris Lines.	English Inches.		Heat Light nings.	Dew.	Froz'n Dew.	Dry Mist.	Fog & Mist.	Rain.	Snow.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	
1853. December,	29.213	29.586	28.476	1.110	29.07	53.82	1.40	52.41	5.69	E: W=1: 3.06. N: S=1: 2.39	75.82	73.56	1.3004	1.386	80	1.484	0.133	0	0	0	9	8	8	6	5	25.25	35.60	26.60	91	63	87		
1854. January, .	29.275	29.959	28.467	1.492	27.95	62.82	-9.62	72.44	6.65	E: W=1: 3.20. N: S=1: 4.00	442.92	59.16	3.4867	3.717	78	1.481	0.133	1	0	0	3	0	6	8	6	24.12	32.90	27.05	85	68	81		
February, .	29.240	29.693	28.591	1.102	35.37	59.22	10.40	48.82	6.35	E: W=1: 2.45. N: S=1: 1.96	536.28	96.35	4.3930	4.683	74	1.793	0.159	2	0	0	6	8	4	8	3	30.42	41.67	33.35	81	64	76		
March, . .	29.177	29.639	28.644	0.995	42.57	73.85	18.50	55.33	5.68	E: W=1: 2.95. N: S=1: 1.89	800.86	6.00	5.6030	5.973	71	2.327	0.204	2	2	1	8	10	6	10	1	36.72	50.67	41.22	82	52	77		
April, . . .	29.195	29.737	28.751	0.996	51.12	86.00	21.20	64.80	6.37	E: W=1: 1.20. N: S=1: 1.46	570.96	45.93	4.2840	4.567	71	3.095	0.275	9	4	9	3	6	1	10	3	46.17	59.45	48.20	82	55	77		
May, . . .	29.142	29.391	28.618	0.773	61.92	83.97	34.70	49.27	5.23	E: W=1: 1.72. N: S=1: 3.82	1412.36	0.00	9.8081	10.455	70	4.313	0.382	8	4	13	0	3	3	14	0	56.07	70.25	58.10	81	52	79		
June, . . .	29.168	29.444	28.813	0.631	70.92	94.10	43.70	50.40	4.53	E: W=1: 3.26. N: S=1: 4.60	263.75	0.00	1.8310	1.952	77	6.530	0.577	11	6	18	0	2	3	11	0	66.65	79.47	66.65	86	57	87		
July, . . .	29.231	29.453	29.053	0.400	77.22	98.15	52.92	45.23	3.11	E: W=1: 1.45. N: S=1: 1.97	455.35	0.00	3.1622	3.371	71	7.328	0.657	6	10	26	0	0	1	7	0	71.37	88.02	72.27	81	49	84		
August, . .	29.248	29.399	29.115	0.284	75.42	98.15	31.35	66.80	3.92	E: W=1: 2.62. N: S=1: 0.71	184.95	0.00	1.2840	1.369	70	6.637	0.586	6	4	18	0	10	3	6	0	68.00	87.12	70.92	85	44	80		
September, .	29.266	29.710	28.946	0.764	70.85	99.72	38.75	60.97	4.13	E: W=1: 2.78. N: S=1: 0.81	146.89	0.00	1.0200	1.087	73	6.068	0.542	5	4	7	0	4	2	8	0	63.50	81.95	67.10	87	51	80		
October, . .	29.337	29.648	28.973	0.675	55.17	79.70	28.62	51.08	4.72	E: W=1: 2.50. N: S=1: 1.89	378.86	0.00	2.6310	2.805	79	2.889	0.346	1	0	7	4	0	4	9	0	47.07	65.52	52.92	93	57	87		
November, .	29.186	29.719	28.716	1.003	38.40	64.40	19.85	44.55	6.02	E: W=1: 8.71. N: S=1: 1.43	460.40	2.40	3.2140	3.426	76	1.905	0.169	0	0	0	9	7	2	7	1	32.90	44.82	36.95	84	62	81		
Sums, . . .											5729.40	283.40	42.0174	44.791				51	34	99	42	58	43	104	43								
Means of the Year, . . .	29.2232				52.998				5.20	E: W=1: 2.991. N: S=1: 2.244					74	3.913	0.3464									47.35	61.45	50.11	85	56	81		
SEASONS.																																	
Winter, . .	29.243	29.959	28.467	1.492	30.797	62.82	-9.62	72.44	6.23	E: W=1: 2.903. N: S=1: 2.783	1055.02	229.07	9.180	9.786	77	1.586	0.142	3	0	0	18	16	18	22	14	26.60	36.72	29.00	86	65	81		
Spring, . .	29.171	29.737	28.618	1.119	51.870	86.00	18.50	67.50	5.76	E: W=1: 1.96. N: S=1: 2.39	2784.18	51.93	19.695	20.995	71	3.245	0.284	19	10	23	11	19	10	34	4	46.32	60.12	49.17	82	53	78		
Summer, . .	29.216	29.453	28.813	0.640	74.520	98.15	31.35	66.80	3.85	E: W=1: 2.44. N: S=1: 2.43	904.05	0.00	6.277	6.692	73	6.832	0.604	23	20	62	0	12	7	24	0	68.67	84.87	69.95	84	50	84		
Autumn, . .	29.263	29.719	28.716	1.003	54.807	99.72	19.85	79.87	4.96	E: W=1: 4.66. N: S=1: 1.38	986.05	2.40	6.865	7.318	76	3.954	0.355	6	4	14	13	11	8	24	1	47.82	64.10	52.32	88	57	83		

YEARLY EXTREMES.

MEAN TEMPERATURE OF THE WARMEST AND COLDEST DAY.

	Maximum.	Date.	Minimum.	Date.	Range.		Fahrenheit.	Reaumur.	Date.
Barometer—English Inches	29.959	23d January, 1854	28.467	12th January	1.492	Warmest day	85.55	23.8	30th July.
Thermometer—Fahrenheit	99.72	4th September	9.62	23d January	109.34	Coldest day	2.07	—13.3	23d January.
Thermometer—Reaumur	30.1	“	—18.5	“	48.6	Range	83.48	37.1	

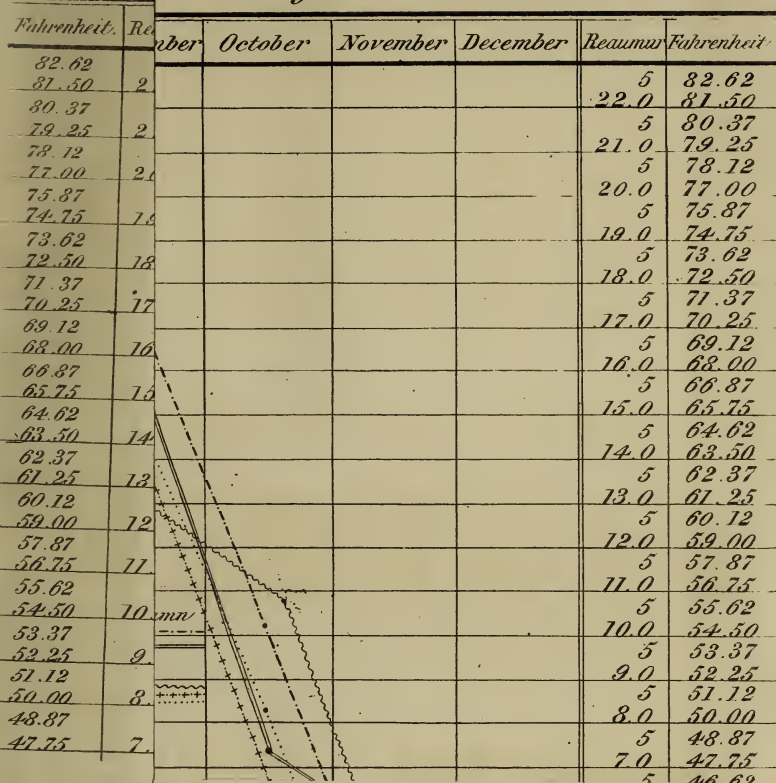
Plate I.

Latitude $39^{\circ} 31' N.$

mantown.

Longitude $84^{\circ} 20' W.$

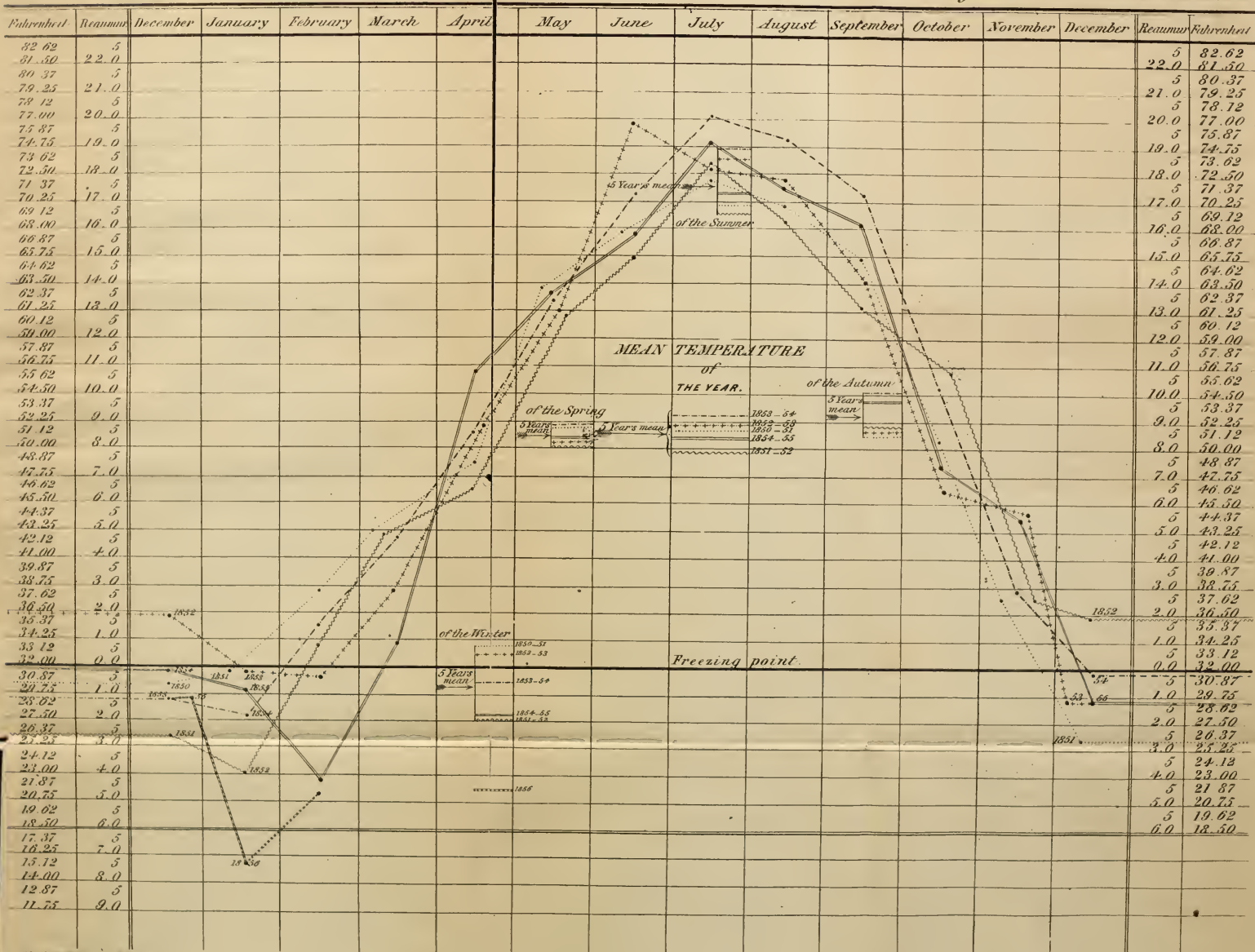
Height of Station above the Sea 720 F.

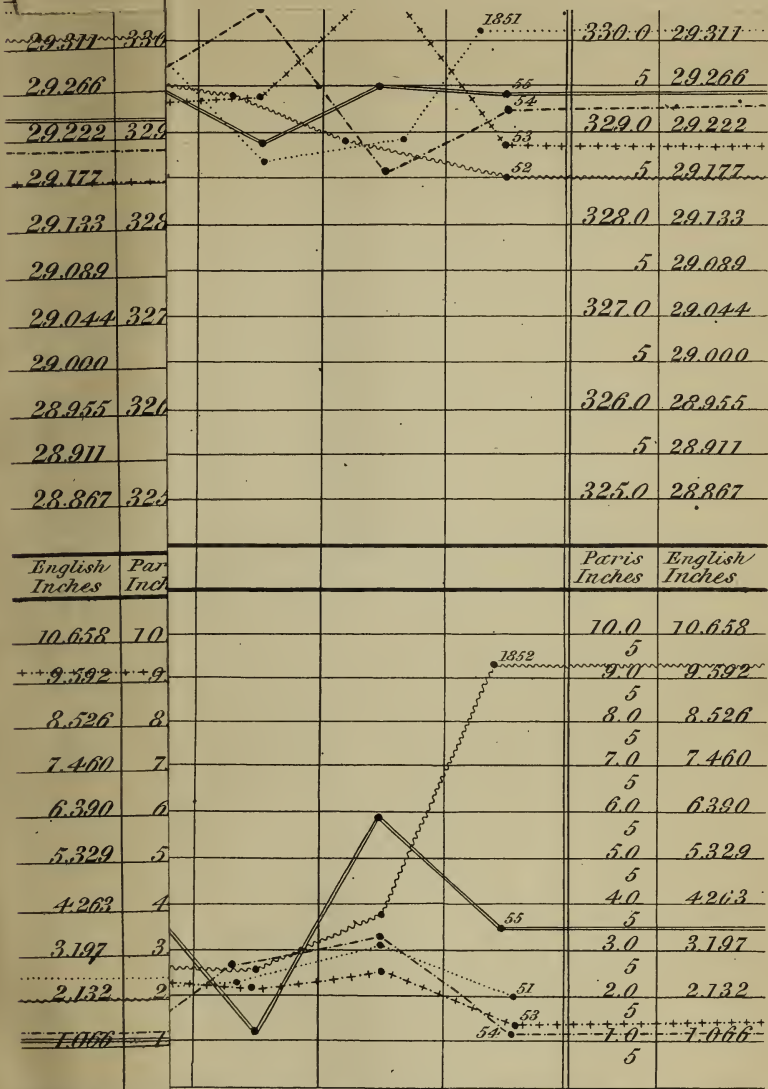


MONTHLY MEAN TEMPERATURE.
Climale of Montgomery County Ohio. — Observations made at Germantown.

BY LOUIS GRONEWEG.

Plate I.
 Latitude 39° 31' N.
 Longitude 84° 20' W.
 Height of Station above the Sea 720'.
 1856





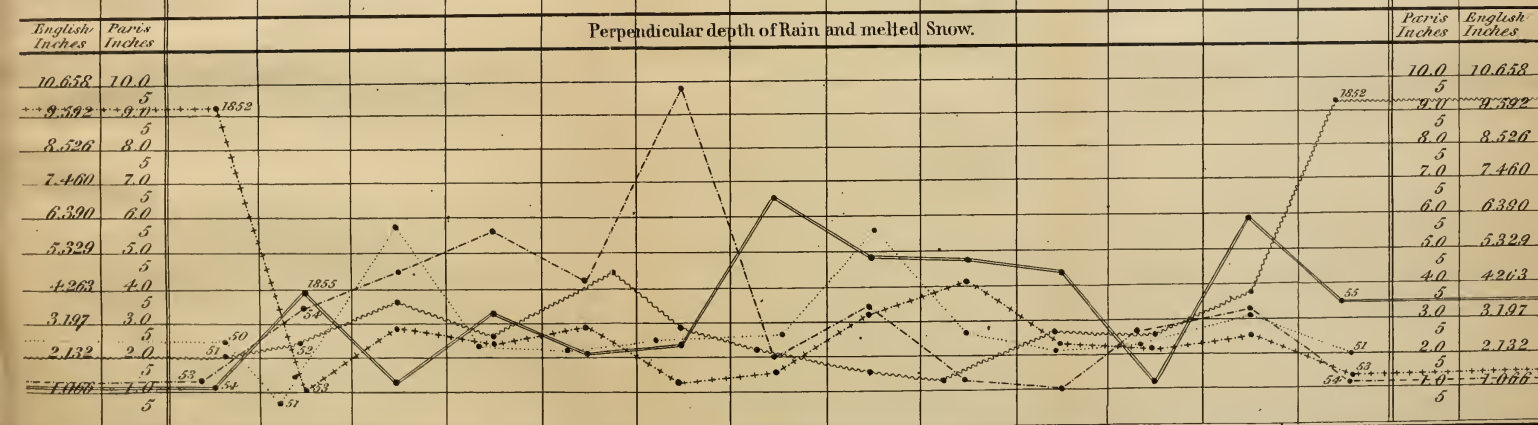
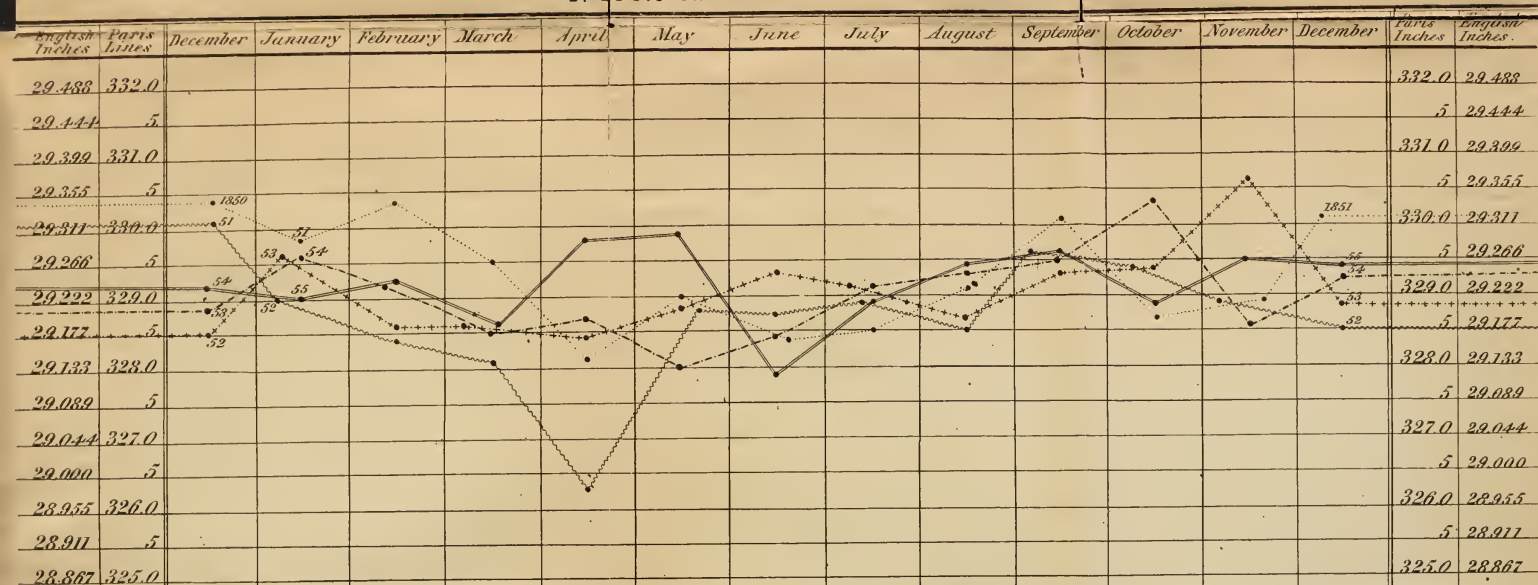
Middleton, Wallace's
inches

5 years Mean 36,663 P. in. = 39,075 Engl. inches

MEAN OF BAROMETER

corrected and reduced to the Freezing Point or 32° Fahrenheit. Observations made at Germantown, Ohio

BY LOUIS GRONEWEG.



in 1850 - Rain and Snow

The whole amount of rain and melted snow was: 1850 - 51 the perpendicular depth/ 33.534 Paris inches = 35.703 Engl. inches

1851 - 52	30.986	= 33.039	5 years Mean 36,663 P. in. = 39,075 Engl. inches
1852 - 53	34.734	= 37.019	
1853 - 54	42.017	= 44.762	
1854 - 55	42.043	= 44.860	

METEOROLOGICAL OBSERVATIONS

MADE IN

MONTGOMERY COUNTY,

SOUTHERN OHIO,

AND A

CONDENSED TREATISE

ON

METEOROLOGY IN GENERAL.

By L. GRONEWEG,

PRACTICAL AND ANALYTICAL CHEMIST, MEMBER OF THE AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE, AND METEOROLOGICAL OBSERVER FOR
THE SMITHSONIAN INSTITUTION.



GERMANTOWN:

PUBLISHED BY THE AUTHOR.

1856.

CINCINNATI:
WILLIAM OVEREND & CO. Printers,
25 West Fourth Street.

ON

METEOROLOGY IN GENERAL.

“THE prosperity of the United States, as a whole, is intimately connected with and dependent upon its climate. Its greatest business interests are those of agricultural productions, with those immediately dependent upon them as the direct exchange of, and commerce in, raw products. To the planting States, more particularly, a knowledge of the permanent climate of *every district* is most important, as a guide to its general productive capacity, and to its special adaptation to particular products.”

[Prof. LORIN BLODGET.

Granting the above position to be true, my observations of five years, which I herewith offer to the public, will not be deemed superfluous.

This treatise is not directed to a particular class. I do not wish to recognize special classes among civilized people. Every person, the farmer, the mechanic, the physician, etc., will find material interesting to him; if not generally, at least partially so. That it may prove useful, is my desire.

The observations were made at Germantown, Montgomery county, Ohio.

Germantown is a handsome village, situated in the fertile valley of Twin creek, a tributary to the Miami river. The different instruments used in making these observations, will hereinafter be described, and are placed as follows:

The *Barometer* is a crane-barometer (having no constant level) with two microscopes for observing the accurate stand of the mercury column. It is graduated so fine as to show the hundredths of a Paris line, or the twelve-hundredths of a Paris inch,

which enables me to estimate the thousandths of a Paris line.* Two thermometers are attached to the barometer; the bulb of one is immersed in mercury, the other surrounded by metal: the first to show the temperature of the mercury, the other the temperature of the scale. The fixed point which serves as an invariable point of reference, is the level of the bed of a rivulet, washing my garden. The zero of the scale of the barometer is 13 ft. 6 in. above it. It is placed near a window on the north side of my house.

The scale of the *standard thermometer* is graduated according to Reaumur, the degrees being subdivided into tenths of degrees. It is placed in the open air on the north side of the house, always in the shade, and ten inches from the walls of the building. The bulb is 5 ft. 9 in. above the ground. It is protected against its own radiation to the sky, and sheltered from the rain, snow and hail.

The *psychrometer*, or wet-bulb thermometer, is also graduated according to Reaumur, and the degrees are subdivided into tenths of degrees. It is situated like the standard thermometer, on the same wooden bars, some inches off. The linen cloth which surrounds the bulb is of medium fineness, and is changed every two months, or as often as necessary.

The *self-registering thermometer*, which indicates the minimum is graduated also according to Reaumur, and placed beside the common thermometer, in a horizontal position, with the bulb opposite and free. It is not filled with mercury as the other thermometers, but with alcohol, and fitted with a glass stick, which remains at the lowest point.

The self-registering thermometer, indicating the maximum, became broke, for which reason all my observations of the maximum are the results of observations frequently made in daytime, or from the observation at 2 P. M.

All these instruments are correct, except the barometric vacuum keeps a little air; the sound which it gives by inclining, to cause the mercury to strike against the top, is flat, not quite clear.

The *ombrometer* or rain gauge is a zinc funnel to which are attached two graduated cylindrical glass vessels. The square

* 135.114 Paris lines are equal to 12 Eng. inches; or 337.785 to 30 Eng. inches.

opening of the funnel is of the size of one Paris square foot, or 144 Paris square inches, and one Paris inch of rain in depth gives one hundred and forty-four cubic inches of water. Each division of the glass contains a cubic inch of water; each of them represents a hundred and forty-fourth of a Paris inch of rain fallen into the ombrometer. These degrees are large enough to permit me to estimate the thousandths of an inch. It is placed in an open square.

I am not in possession of a snow-gauge, and have therefore collected all the snow by the funnel of the ombrometer, and after melting measured it the same way I did rain-water.

The *wind-vane* is placed on a little hill near the house, away from every obstacle whatever. The observations are made three times daily, in the first two years (1851 and 1852); they were made at 6 A. M., 2 P. M. and 10 P. M., in the following three years (1853, 1854 and 1855), for the purpose of producing uniformity with the observations made by the Smithsonian Institution, at 7 A. M., 2 P. M. and 9 P. M. All measurements are reduced to English measure to conform with the Institute, French measure being also retained for greater correctness and comparison.

The *barometer*, which was invented by Evangelista Torricelli, in 1640, is used to measure the pressure of the air. The atmospheric pressure on the surface of the earth, and on all parts of our bodies, amounts to a weight of 15 pounds on the square inch. This instrument is called barometer from *βαρος* (weight, pressure), and *μετρον* (measure). It indicates the minute changes of the atmosphere, in regard to its gravity or pressure, and enables us also to use it for the measurement of elevations, of mountains, etc., because the stand of the mercury is standing in a *certain* proportion to an ascending elevation; it is therefore an instrument of much importance. Its construction depends on the known fact, that if a glass tube, three feet in length, be filled with mercury, and its open end be inverted in a basin of the same liquid, the mercury in the tube will stand, for instance, at the level of the sea, nearly 30 inches higher than the surface of that in the basin. This column of mercury is balanced by a column of air of the same section as the column of mercury and extending to the top of the atmosphere.

The *thermometer*, an instrument much known, was invented in the latter part of the sixteenth century, by Cornelius Drebbel, as it is generally supposed, and is used to observe the temperature of the air, of fluids, etc. Its principles belong to the law of expansion by heat. The mercury is that material which expands most gradually from the freezing point to the heat of boiling water, and is therefore mostly used for filling the thermometrical glass tube. There are different scales; the scale according to Reaumur is divided, from the freezing point to boiling water, into 80 degrees; the scale of Celsius, into 100 degrees, and that of Fahrenheit into 180 degrees; so that 4 degrees Reaumur are equal to 5 degrees Celsius, and to 9 degrees Fahrenheit. By Reaumur and Celsius the freezing point of water is marked at 0, zero, but by Fahrenheit at 32 degrees, and zero by Fahrenheit is therefore 32 degrees below the freezing point of water. Its use gave its name θερμος (warmth), and μετρον (measure).

The *wet-bulb thermometer* is called, by August, *Psychrometer*, from ψυχρος (cold), and μετρον (measure), because it shows generally a lower temperature at the same time than the common thermometer, on account of the evaporation of the water which is used to wet it. The dryer the air the more the two thermometers will differ; the contrary conditions will produce a closer approximation between them; and this fact affords us a medium to ascertain, in the surest way, the humidity of the air, for which it is used. Both, the common thermometer as well as the wet-bulb thermometer, are to be fitted, for the purpose, at the same stand of the barometer; except this, one would be different from the other, because water does not base at the same temperature on different stands of the barometer. For instance, on very high elevations, or mountains, where the barometer stands very low, water boils at a temperature which is not sufficient to cook eggs.

The tables, accompanying this treatise are prepared, for every year, to show the mean stand of the barometer in each month; also, the mean temperature, the mean direction of the wind, the mean of the relative humidity and of the force of vapor; the maxima and minima of the barometer and thermometer, the quantity of rain and snow fallen in each month, the perpendicu-

lar depth of rain and melted snow, the clearness of the sky, number of thunder-storms, number of days with heat-lightnings, dew, rain, snow, etc.

The barometrical observations are reduced to 32° Fahrenheit.

The clearness of the sky, or the amount of clouds, is noted in numbers from 0, clear, to 10, entirely cloudy.

The mean of the several instruments, etc., is, the result of the sums of the three observations daily, made at the different hours, divided by three, and the monthly mean is drawn from these means for each day. Separately will be found the monthly mean of the observations at 6 resp. 7 A. M., 2 P. M., and 9 resp. 10 P. M., for the temperature and the relative humidity of these times; and each table shows the means and sums of the above for the whole year and the different seasons. I wish to observe, that the meteorological year begins December 1, and ends November 30 of the following civil year, and that the meteorological seasons are, then :

Winter — December, January, February.

Spring — March, April, May.

Summer — June, July, August.

Autumn — September, October, November.

In the thermometrical observations, the quantity above zero is always written without a sign; the negative quantity is individually marked with the sign minus, (—).

The minima of temperature of the month and year are taken from the self-registering thermometer. The relative humidity is the per centage of moisture which the air at the time contains; 100 being the full saturation.

The force of vapor is the barometrical pressure, which is caused by the free moisture of the atmosphere.

The mean direction of the wind is noted by Schow, viz: the different directions of winds, which were noted in a fixed time, day, month, year, are added up; as, for instance, the northerly wind was noted six times, the southerly eight times, it bears the proportion, N.: S.=6.: 8, or 1: 1.33. Consequently, the southerly wind was in that time prevailing so much as to bear the proportion of 1: 1.33, or N.: S.=1: 1.33. The same of east and west winds. Therefore the tables contain more of a comparison

between north and south and between east and west wind, in a fixed time. than its mean direction. Lambert's method of work, on this point, is excellent; but I did not avail myself of it.

Each table also contains the yearly extremes of the barometer and thermometer, and the mean temperature of the warmest and coldest day of the year.

The sixth table shows the mean of all five years in the same manner as the others do for each year separately, and this gives the climate of Montgomery county as near as five years observations possibly can do it.

The plates are arranged for greater convenience of comparison. Every year has its own mark; the dots between the descending lines, which separate the different months, are united by lines of the year, and show the degrees in tenths, or the inches and lines, which are marked on both sides. The horizontal lines in the first plate show the mean temperature of the different years and seasons.

PRESSURE OF THE ATMOSPHERE.

The barometer, by its oscillations, is said to show the different variations of the pressure of the atmosphere. But these oscillations are very often depending upon the temperature of the surrounding air; it therefore becomes necessary to reduce all barometrical observations to a fixed point—to the freezing point, or 32° Fahrenheit. As may be expected, these oscillations of the barometer, which depend on the surrounding temperature, are very irregular, but there are oscillations which are independent of it, and are very regular. At noon the mercury column of the barometer begins to decline, till between three and five P. M., when it sinks to the lowest point. It ascends then again, and reaches a maximum between nine and eleven P. M. It declines then again till about four A. M., when it sinks to a minimum, and then ascends again to a maximum about ten A. M. This seems to be the regularity alluded to, uninfluenced by geographical latitude, but not by the different seasons of the year, so that in the winter both the maximum and the minimum in the morning and evening, are nearer at noon by about one or two hours than in the summer season.

The barometrical mean of every month in the year, in our

latitude, declines from January to the summer months, and advances again from summer to winter. This will be seen in our tables, after subtracting the amount of the force of vapor, or the amount of pressure which produced the free moisture in the air on the barometrical volume, and shows that the maximum falls in the winter and the minimum in the summer.

Monthly mean of the barometer, after subtracting the amount of the force of vapor, or the monthly mean of the pressure of the dry air, at our place :

	English Inches.
December.....	29.108
January.....	29.126
February.....	29.083
March.....	29.004
April.....	28.909
May.....	28.833
June.....	28.639
July.....	28.602
August.....	28.636
September.....	28.769
October.....	28.959
November.....	29.037

Finally, there are irregular barometrical oscillations at the time of gales, etc., or caused by the different winds, viz: the stand of the barometer is not the same if the wind blows from the north or from the south. In Europe, the highest stand of the barometer is generally with northeast winds, and the lowest with southwest winds; while in this country the maximum takes place when the wind blows from the northwest, and the minimum when it blows from the southeast; or, what is the same for both hemispheres, its maximum is caused by the coldest, and its minimum by the warmest wind. These *irregular* oscillations are greater in winter than in summer; also greater in cold countries than in warmer ones, or, in other words, they increase with the increased distance from the equator, with some exceptions. All these oscillations of the barometer can be explained by the fact that the barometer shows the difference of

the temperature of different parts of the country, and only in this manner can they afford an explanation.

When the mercury column of the barometer in one part of the country declines, it is in consequence of the increasing warmth in this part, in opposition to the surrounding part; the place itself may be warmed, or the surrounding part may grow cold. If the barometer should rise at the place, it is an evidence of its being colder than the surrounding parts.

Thus then, the declining of the barometer is accompanied by warm winds, and the increasing accompanied by cold winds; consequently, the thermometer increases when the barometer declines, and declines when the barometer increases. Though it is generally true that a high stand of the barometer indicates clear and fair weather, and a low stand rain weather, yet a person would be often deceived by trusting to his barometer for an indication of the weather. More dependence can be placed on this instrument in regard alluded to, at such places where warm winds at the same time are rain winds. At our place, the warm southeast wind is the rain wind, the cold northwest wind the dry ones which caused fair weather, and the barometer inclines by southeast and arises with northwest wind. But at the mouth of the La Plata river, the southeast wind is the colder wind, which raises the barometrical column, though it is the rain wind, and the northeast wind is the warm wind, which inclines the barometer, though it is the wind which caused fair weather.

TEMPERATURE.

The temperature has also its variations, especially in our latitude—as well daily as yearly. Of daily variations we find one generally in the morning, just before sunrise, and the other some hours after noontime—in the summer later than in the winter; so that just before, or about sunrise, the minimum takes place, and some hours after noon the maximum. The explanation of this fact is as follows: Before noon, when the sun rises higher and higher, the surface of the earth receives more warmth than is lost by radiation, consequently its temperature and the temperature of the atmosphere must experience an increase of

heat, and this will be still the case for some hours after noon. When the sunset approaches nearer and nearer; the rays of the sun have at this time not the same effect, and the warmed earth will lose more warmth than the sun's rays can supply. This cooling continues after sunset, till the morning-glory indicates the reappearance of the sun. The arising of clouds, and a change of winds, etc., may, however, produce a change in my stated positions; it is therefore necessary to make as many observations as possible, in order to find the law in regard to the daily variations of the temperature at different places.

To determine the mean temperature of every day, many ways are resorted to, because an hourly observation, which would give the correct one, is too troublesome. The extremes are used for this purpose; observations four times daily, three times daily, at different hours, etc., and at present mostly three times, at six or seven A. M., two P. M., and nine or ten P. M., are the hours of observation, because these hours give the nearest mean in comparison to the mean given by hourly observations. The mean temperature of the days, divided by the number of days, gives the mean of the month, and the arithmetical mean of the twelve months of the year, gives the mean temperature of the year.

While the mean temperature of the year at one place does not change much, the variation of the mean temperature of the same month in different years is often very changeable. But more changeable is the mean temperature of one day in different years.

The month of July is, in our latitude, generally the warmest, and January the coldest month. At the mean time of January the temperature generally increases very slow, with more rapidity in April and May, then more slowly again to the mean time of July, when it begins to decline very slowly in August, much more in September and October, and falls again in January to its minimum. This state of things depends, as may be easily seen, on the rising of the sun, nearly in the same way as by the daily variation above alluded to. The ranges between the monthly extremes increase from July to January, and decline again to July.

Important variations of the yearly normal state of the temperature are never local, but ever extended over a great part of

the country, and this will be also the case in this so very severe winter of 1856.

I exhibit below a statement to show that the mean temperature of the year at different places in the same latitude is not always the same; and have to notice that it is also in regard to the different reasons.

Place.	Latitude.	Longitude of Paris.	Mean tempera- ture of the year.
Fort Snelling.....	44° 53' N.....	95° 28' W....	43.88 Fahr.
Sevastopol	44° 36' N.....	31° 12' E. ...	52.70 “
Council Bluffs.....	41° 25' N.....	98° 03' W....	49.46 “
Constantinople.....	41° 00' N.....	26° 39' E. ...	56.66 “
Germantown	39° 30' N.....	86° 36' W....	51.44 “
Madrid	40° 25' N.....	6° 02' W....	57.56 “

Lines drawn on our globe for uniting the places which have the same mean temperature of the year, are called by Humboldt, Isothermes; the lines which unite the places with the same mean temperature of the winter, Isochimenes, and the lines which unite the places with the same mean temperature of the summer, Isotheres.

The warmth equator, or the line which is obtained on the globe by the union of all the places of greatest heat, does not coincide with the earth equator; therefore it is not always the warmest place which is situated on the earth equator. On the earth's equator the mean temperature of the seashore is 81.50° Fahr., and on the western shore of America and Africa, a little less. In the interior of both continents, especially in Africa, the mean temperature is higher than on the shore; it even reached in the interior above 84° Fahr.

The northern isothermal line of 77° Fahr. travels from Vera Cruz to the southern part of Florida, rises a little to the north and inclines again to the western shore of Africa. In Africa, it again experiences an elevation, travels through the northern part of the Red sea, mounts again to the north in Asia, and inclines to the Pacific ocean, to mount again near the western shore of America. The line of New York, or the isothermal line of 50 degrees Fahr., runs in the Atlantic ocean up to the north, near

England, to 56° of northern latitude; inclines in Europe and Asia, mounts again near the western coast of America, and inclines a little in the interior, to reach New York again.

The extremes which fell under my observation are as follows:

Year.	Maxima.	Date.	Minima	Date.
1851 . . .	94.32° Fahr.	Sept. 11 . . .	— 7.37° Fahr.	Jan. 31
1852 . . .	94.55 “	July 23 . . .	— 31.45 “	Jan. 20
1853 . . .	97.47 “	June 20 . . .	— 14.12 “	Feb. 9
1854 . . .	99.72 “	Sept. 4 . . .	— 9.62 “	Jan. 23
1855 . . .	93.42 “	July 19 . . .	— 1.97 “	Feb. 26

This gives a mean, for the maximum of 95.89 degrees, and for the minimum, —12.91 degrees Fahr., which may happen every year.

WIND.

Among the natural agencies which are at work to disturb the equilibrium of the atmosphere, and to give rise to aerial currents, the difference of temperature in different parts of the earth is most important, viz: if one country is more heated than the other, we find in the upper strata of the atmosphere a wind which blows from the warmer country to the colder one; and on the contrary, at the surface of the earth a wind which blows from the colder to the warmer country. Franklin's experiment of a lighted candle at the open door of a heated room, clearly demonstrates this. At the top of the door the flame, when held above, is blown *from* the room; when placed below, near the ground, it is blown *into* the room, consequently the light, warm air above rushes out of the heated room, and is replaced by heavier and colder air from below. When a lighted candle is placed in the middle of both, the flame will be straight, and not be affected by a current of air. And the same, in a greater measure, occurs on our globe. The equator forms the warm room, the pole a cold one, and the air rushes from the equator to the poles, and from the poles to the equator, but not direct, on account of the rotation of the earth; that at the surface, coming from the pole, takes an easterly direction, while that which flows above, coming from the equator, takes a westerly course. This is the origin of the trade winds at the surface of the earth, and of the great

westerly current which is almost constantly moving in the upper strata over the middle and northern portion of the United States, sinking lower and lower. All other directions of the wind are derived from these primitive directions, southwest and northeast. Its change from one place on the compass to another is generally from south to southwest, west to northwest, north to northeast, east to southeast, to south again. But the turning of the wind is not always so regular; sometimes the wind turns back, and this takes place more on the west side than on the east side of the compass.

The effect is remarkable which is experienced at the different times of the day, and also at the different seasons, upon the turning of the wind, but this is more the case at the seaboard than in the interior of the country.

It has been most satisfactorily proven by Prof. Coffin, that southerly winds in North America generally are much more common in summer than in winter, and that to this wind is to be ascribed the amazing fertility of the climate for sugar, cotton, Indian corn and tobacco.

Gales and tornadoes are the consequence of considerable disturbances in the equilibrium of the atmosphere, which probably occur by condensation of the vapor in the air. The surrounding air flows rapidly from all sides to the place of the rarified air, while the minimum of the pressure of the air moves forward itself. This theory is adopted by Prof. Espy. Dove calls tornadoes, whirlwinds which are progressive, and R. Hare calls them electrical whirlwinds, under the same condition.

HUMIDITY OF THE AIR.

A *daily* variation of the humidity of the air, which occurs, depends on the variation of the temperature of the day, because by an increase or decrease of heat, water is caused more or less to evaporate. It is therefore rational to suppose that the humidity of the air will increase or decrease in daytime as the day is growing warm or growing cold, and the same is generally the case with the *yearly* variation of the humidity of the air, which increases, like the mean temperature, from January to July, and decreases from July to January, in our latitude.

If in summer the morning-glory appears with an increase of temperature, humidity follows till nine A. M. At this time, a warm ascending air column carried the steam to the upper strata, and consequently the humidity of the lower strata diminished, though by increase of heat the formation of vapor continues. This diminution will continue till about four P. M., at which time the humidity of the lower strata again increases, because now the ascending air column, which the steam has carried to the upper strata exists no more; but this continues only till about nine P. M., because at this time the temperature gets lower and lower, by which the evaporation more and more ceases. This shows for the summer two maxima, at nine A. M., and nine P. M., and two minima, at four P. M., and about sunrise. This process in the winter season is more singular. The effect of the sun is at that time not so intense, and only one maximum is to be observed, at two P. M., and one minimum, at the time when the sun rises again. The vapor ascends in the winter season very regularly till the afternoon, about two P. M., and when the temperature sinks, the vapor will be partly condensed by cooler objects, and the humidity diminished till morning. If the cooling of the air is occasioned by a cold solid body, the vapor is then condensed in small drops of water, as may be observed on the outside of a cold glass when brought into a warm room. The temperature which occasions this is called the dew-point, signifying the temperature by which the air is saturated with vapor.

People say "the air is dry" when the water rapidly evaporates, when wet objects in a short time dry in the air; and on the contrary, "the air is wet," when wet objects dry slowly, or when the least change of temperature, being cooler, is sufficient to produce wet condensations. In this manner we call the air dry when the dew-point is far off, and wet when it is near the temperature of the air. But by this we can form no judgment in regard to the absolute humidity of the air. For instance, when in the winter, at a temperature of 35 deg. Fahr., the air contains in a closed room of ten square feet only six grains of vapor, the air will be called very wet, not only because wet objects would dry in them very slowly, but also because the air is at this temperature, and at that amount of vapor, nearly

saturated, the least change of temperature, being cooler, would be sufficient to produce wet condensations, although the absolute quantity of vapor is very small. If the same room, at a temperature of 77 deg. Fahr., contains thirteen grains of vapor, we would call the air very dry, not only because wet objects would dry in it in a short time, but also because at this temperature the air would contain twenty-three grains of vapor before being saturated, or the air must be cooled, for its saturation, to about 59 deg. Fahr.

The same case is with the *relative humidity*, which shows nothing else than a per centage of humidity at a fixed temperature; but to say nothing about that, what would be the per centage when the air would be heated or cooled. The lower the temperature of the air, the sooner it is saturated, and this is the reason why the relative humidity increases when winter approaches, and decreases toward summer, or why its maximum occurs about at the time of sunrise and its minimum at noon.

Our tables show the least per centage of the humidity in the spring; in April it reaches its minimum, and increases till December, reaching its maximum, and only in one year the relative humidity reached its maximum in January, and its minimum in June. This irregularity alluded to seems to me very remarkable. On the contrary, the absolute humidity, or the force or pressure of vapor increases, according to the law, exactly like the mean temperature; in the month of January showing the minimum, increasing till July to its maximum, and decreasing till January.

DEW.

It is observed that when the surface of the earth was heated by the rays of the sun, the air became heated; hence, during the day the lower strata will always be warmer than the upper ones. But a change takes place after sunset. The earth continues to radiate heat without receiving any in exchange, and its temperature consequently diminishes, often to two, three, sometimes seven and eight degrees below the temperature of the air. Neither does the air so readily part with its heat, and therefore it attains during the night a higher temperature than the surface of the earth; it is only cooled where it comes in contact with the colder

earth. If this cooling by radiation should reach the dew-point of the air, then the vapor is condensed on the cooler soil or vegetation in the form of small drops. If the temperature of the earth sinks in the night to the freezing point, or below it, the aqueous vapor is deposited in a solid form, which is called frozen dew, or white frost. In clear and serene nights the radiation of heat from the earth is the greatest, and dew takes place; but it is obstructed by clouds and wind.

FOG AND CLOUDS.

Fogs rise, generally, if the water of lakes, rivers, or the wet soil is warmer than the air, which is saturated with aqueous vapor. The vapor which arises from the water, etc., is condensed again when it enters the colder air, which is already saturated with water. This is the reason why fogs mostly arise in the fall above rivers, lakes, and wet soil. Fog often arises in summer, after thunder storms, above rivers, etc., the air being warmer than the surface of the water. The air is saturated with aqueous vapor, and it will be condensed by the cooler water of the river, etc. However, fogs will not only arise above lakes and rivers, but also in the interior of the country; and this will be the case when warm and wet air becomes mixed with cooler air, so that its temperature sinks below the dew-point.

Clouds are nothing else but fogs which are suspended in the upper strata of the air, as fog is nothing else than clouds near the surface of the earth, and consists of small blisters, fog-blisters, which may be partly filled with water, partly hollow, containing uncondensed vapor. The appearance of the clouds is according to their lower or higher suspension, according to their possessing more or less density, and their illumination by the rays of the sun, etc., and therefore very manifold. The forms of the clouds are called, in the terminology of Howard, as follows:

1. The cirrus, or curl-cloud, is composed of loose filaments, the whole of which sometimes resembles a pencil, sometimes curly hair, sometimes a fine net, or a spider web. They are the highest clouds in our atmosphere, (often 20,000 feet high), consisting of snow parts, even in summer, and subject to southerly winds.

2. The cumulus, or summer-cloud, or starker-cloud, shows itself often under the form of a hemisphere resting on a horizontal base. Sometimes these half spheres are piled upon one another, forming those large accumulated clouds in the horizon which resemble, at a distance, mountains covered with snow. They appear frequently in summer, and arise from ascending air columns. The number and magnitude, also partly the density of these clouds, generally increase till the time of the highest warmth of the day, and decrease again till sunset. At the same time, changes take place in the height of these clouds, its minimum being in the morning, its maximum in the afternoon, and its sinking again toward the evening.

3. The stratus, or fall-cloud, is a horizontal band, which is formed at sunset and disappears at sunrise. Besides these three principal forms, to which four transition forms belong, namely, the cirro-cumulus, or sonder-cloud, the cirro-stratus, or wane-cloud, the cumulo-stratus, or twain-cloud, and the nimbus, or rain-cloud, are several intermediate forms to which it is difficult to assign a name, and it may only be said that the nimbus, this well known cloud, is distinguished by its uniform grey tint, its fringe and indistinct edges.

RAIN, SNOW AND HAIL.

Rain falls if the temperature suddenly sinks, when the small fog-blisters of the clouds run together, when the velocity of the falling increases, and drops reach the earth. If the temperature of the air in the winter season reaches near to the freezing point, or below it, snow falls; and in the spring and autumn often what is called sleet, consisting of small balls of snow, which are white and opaque, commonly without a crust of ice. These forms are to be distinguished from frozen rain drops; they are formed of little balls of transparent ice, and arise generally in the winter or spring. Of the formation of snow and sleet, little is yet known, but the surmise is, that probably in that cloud which gives snow and sleet the snow is preëxisting, in small crystals, which are growing by condensation of vapor from the surrounding air, till snow-flakes or sleet falls down.

Frozen rain drops appear if cold weather exists and a wet south wind warms the upper strata; rain-drops form themselves, and freeze while descending to the surface of the earth, and on coming in contact with the cold strata. Hail—hailstones are balls of transparent ice in their midst, with a nucleus of snow parts. It falls mostly at the time of the greatest heat of the day, or a little afterward; generally, also, more in summer than in any other season, but there is a difference at different places.

There are many theories in regard to the formation of hail, but all are poor. Volta's theory may be the plainest. He says, there are two strata of clouds, above one another; the sun's rays are absorbed by the upper strata of dense clouds, which consequently causes a sudden evaporation, and this evaporation in the upper strata takes so much warmth to freeze the water in the lower ones, and the hail forms itself, even in hot summer time. The hailstones just formed are of very small size, falling upon the lower strata of clouds, where it takes by condensation of its cold body more water to build there a new strata of transparent ice all over. But this cloud is loaded with another electricity than the first, which gave rise to the hail; the hailstone takes now, not alone water from this cloud, but also electricity, and if both are about equally electrified, the cloud repels the hailstones to the upper cloud again; the upper cloud sends, after a while, the hailstones loaded with ice and the electricity, back to the lower cloud, and this play will be repeated as much as possible by the power of the electrified clouds, until the weight of the hailstone produces its downfall.

This theory seems to afford a plausible explanation, but we ask, how comes it that, if the evaporation in the upper strata of the clouds is caused by the warmth of the rays of the sun, this evaporation should deprive the strata of lower clouds of so much warmth, as to form so much ice or hailstones, even in hot weather? And further, how is it possible for electricity to move such an enormous mass of hailstones from one cloud to another without an electrical discharge?

The quantity of rain which falls in one year on one Paris square foot (the largeness of my ombrometer) amounts generally,

in my place of observation, to 4957.31 Paris square inches,
 And the quantity of snow which falls
 on the same plane amounts, gen-
 erally, if molten, to 357.17 Paris square inches.

Making 5314.48 Paris square inches.

This gives a perpendicular depth of rain and melted snow of
 36.944 Paris inches, or 38.878 English inches, as the mean of
 five years' observations.

From the above quantity of rain, etc., the
 winter generally claims 999.12 Paris
 square inches of rain, and 273.26 Paris
 square inches of melted snow, making
 1272.38 Paris square inches; or a per-
 pendicular depth of rain and melted
 snow of 8.876 Paris inches, or 9.462 English inches.

The Spring generally claims 1419.41 Paris
 square inches of rain, and 36.09 Paris
 square inches of melted snow, making
 1455.50 Paris square inches, or a perpen-
 dicular depth of rain and melted snow of
 10.091 Paris inches, or 10.757 English inches.

The summer generally claims 1354.37
 Paris square inches of rain, or a perpen-
 dicular depth of rain of 9.408 Paris
 inches, or 10.029 English inches.

The Autumn claims, generally, 1120.46
 Paris square inches of rain, and 47.82
 Paris square inches of melted snow,
 making 1168.28 Paris square inches, or
 a perpendicular depth of rain and melted
 snow of 8.096 Paris inches, or 8.630 English inches.

THUNDER STORMS.

IF common water (not pure distilled water) evaporates, the steam shows positive electricity, and the vessel from which the steam ascends negative electricity. Consequently, the steam which arises from the ground, earth, etc., reaches the sky with positive electricity, and the earth retains negative electricity. The same evolution of electricity takes place by the combustion of vegetables: the smoke arises with positive electricity, and the vessel in which the combustion takes place keeps the negative electricity. These and many other processes are the causes of positive electricity of the air, and the negative of the earth.

If the vapor of clouds is rapidly condensed to rain, and electricity enough arises by the process to form a spark, lightning will be seen, and, after this, the thunder be heard. The thunder is heard after the lightning has been seen, because the lightning is seen at about the same moment as it is formed, but the sound of the thunder takes one second to run through a room of about 1,000 feet.

The lightning is formed exactly like the electrical spark on our electrifying machines, and generally moves in the direction from the cloud to the earth. By this, the air is forcibly driven from its place, and after the lightning is past, the air claps together with so much force as to produce the thunder, about in the same way as the sound which will be heard if a pen-case is opened in a hurry, so that the air of the inside is expanded for a moment and claps together again when it opens.

Thunder storms are divided in two classes, because they form themselves, either chiefly in consequence of an ascending air column, or accompany the conflict which exists between opposite winds. The first one generally appears in warm seasons, and the latter one in winter time.

If in summer, on a fair day, the wind is near calm, air columns ascend from the earth very rapidly to the upper strata of the air, increasing the body of the cirri, or curl clouds, which move there with southerly winds. At the same time, in the lower strata, cumuli or summer clouds rise, and the temperature near the

surface of the earth decreases. Dense clouds being formed, a warm wind will blow against these clouds ; while on the surface of the earth cold air streams, below these clouds, flow to all sides, condensing the vapor very rapidly, and evolving so much electricity by their power as to cause a thunder storm.

At the time of thunder storms, the barometer generally declines, which shows a southerly course of wind in the upper strata of the air, and the clouds which form there are moved by that southerly wind. This is the reason why our thunder storms generally move with southerly winds.

In the winter season, therefore, storms commonly arise if a strong southerly wind comes in conflict with a very strong northerly wind, and the air, at the same time, contains vapor enough for evolving more electricity, than is generally possible at this season.

Heat lightnings show themselves, especially in the evening, if thunder clouds are near the horizon, and so far off that the sound of the thunder can not reach our ear. The clouds of remote thunder storms are even, sometimes, below the horizon, and the lightnings are only seen by reflection of the sky.

HAZE, OR DRY MIST.

THE transparency of the air, especially in the fall and spring, is often disturbed by a kind of vapor, which gives a dirty color to the sky, and dims the rays of the sun. The sun approaching the horizon appears to be blood-red, and looking right into his face will not hurt the eye, as it does at other times, his light being so faint that his orb is not to be distinguished, even when he has not yet approached the horizon.

This phenomenon, known in Europe under the names *Höhe-rauch*, and *Moorrauch*, appears frequently after long droughts, and seems to characterize what, in this country, is called the Indian summer. Both phenomena undoubtedly owe their origin to the same cause—the combustion of vegetable matter. In Europe, it is caused by *imperfect* combustion of peat and heath, and in this country, by a more *perfect* combustion of corn-stalks, prairie-grass and wood. This seems to be the only difference between the two

phenomena, and it may be added, that in the central parts of Germany the smoke arises in the months of May and June with northerly winds, whereas, in this country, during the Spring and Fall seasons, with southerly wind.

An opinion is prevalent, in Germany, that dry mist exercises a great influence on the weather, being the cause of the then prevailing northern wind, driving away rain and thunder-storms, and causing cold. All this seems to be at the time of the appearance of dry mist in Germany; but it is only the northern wind, in May and June, generally prevailing then, which causes that dry and cold weather, and nothing else. In this country, the smoke comes with southern winds, causing neither cold, nor dryness, nor driving away thunder-storms; on the contrary, the mean temperature of days on which dry mist prevails exceeds that of the month, rain generally succeeding dry mist; and at the time of dense dry mist, I noticed thunder-storms.

The question then arises, by what is our climate distinguished, and what is the character of its seasons?

The tables show for themselves; the plates likewise, in a graphical point of view; and it remains only necessary, after some remarks in respect to its peculiarity, to offer a comparison between our climate and that of other places. (For which purpose is given the Table VII, for comparison with Humboldt's Asia Centrale).

In regard to the temperature, our climate presents remarkable data, not only in reference to the great range which exists between the daily, monthly and yearly extremes that occur, but also with respect to the range which exists between the mean temperature of the coldest and the warmest month and the coldest and warmest day in the same year.

It is maintained that these extremes arise far off from the equator. The range between the mean temperature of the warmest and coldest month in Gibraltar ($36^{\circ} 7' N.$ latitude) amounted to 17.64° Fahr.; in Lisbon ($38^{\circ} 42' E.$ latitude), 19.96° Fahr., and of St. Petersburg ($59^{\circ} 56' N.$ latitude), 48.96° Fahr., all according to this law; but in Germantown ($39^{\circ} 30' N.$ latitude), 45.36° Fahr., although it should, by the same comparison, be not more than 20° or 25° Fahr. Further, the range between

the mean temperature of the coldest and warmest day in the same year amounts to 83° Fahr., and the range between the maximum and minimum, which occurred in the year, to 109° Fahr., and these great ranges confer the chief character of the climate in the Eastern and Middle States of the Union, as a remarkable peculiarity. The climate of the Far West—California—forms an exception, it being distinguished by its regularity. In San Francisco, the range between the mean temperature of the coldest and warmest month is only 13° Fahr., and the range between the maximum and minimum of temperature, which occur yearly, not more than 54° Fahr.

Further, the mean temperature of the different months increased from January to July, and declined from July to January, at my place of observation, in the following remarkable manner :

It increased from January to February	3.37° Fahr.	
Do. February to March	8.02	"
Do. March to April	10.71	"
Do. April to May	10.98	"
Do. May to June	7.56	"
Do. June to July	4.63	"
And declined from July to August	2.65	"
Do. August to September	5.51	"
Do. September to October	14.61	"
Do. October to November	10.78	"
Do. November to December	9.77	"
Do. December to January	1.94	"

This sudden rapid increase and decline in spring and fall, indicated a climate with very different seasons, and in fact our summer is nearly a tropical one, and our winter sometimes a Russian winter. It is not necessary to travel abroad, visiting other countries for the purpose of ascertaining climatic changes ; every season here offers a simile of foreign countries.

WINTER.

While the mean temperature of the year is conformed with the yearly mean temperature of Paris, capital of France, the

mean temperature of the winter conforms with the winter of Berlin, capital of Prussia; and especially, the winter of 1850-'51 conformed in the mean temperature with the winter of Geneva, $46^{\circ} 12'$ N. latitude.

1851-'52	with the winter of	Warsaw	.....	$52^{\circ} 13'$	N. lat.
1852-'53	"	"	Gottingen	.....	$52 13$ "
1853-'54	"	"	Augsburg	.....	$48 22$ "
1854-'55	"	"	Warsaw again.		

Besides this, the winter is distinguished from all the other seasons by its greatest range of atmospherical pressure, and in regard to sudden changes in the mean temperature from one day to the next. I have noticed ranges between the mean temperature of two succeeding days of 33 degrees Fahr. January 2d, 1854, the mean temperature of the day was 13.32 deg. Fahr., and January 3d, the mean temperature was 45.05 deg. Fahr.

The winter shows, further, the greatest relative and the least positive humidity, according to the law alluded to, and a quantity of rain and melted snow, which is generally a little more than in the fall, but less than in the spring and summer. In the afternoon, at 2 P. M., the air is generally 10 degrees Fahr. warmer than in the morning, and 7 degrees than in the evening.

SPRING.

The mean temperature generally conforms to the mean temperature of the spring of La Rochelle, in France, ($46^{\circ} 09'$ N. latitude.) Especially, the spring of 1851 conformed with that of Constantinople, 41° N. latitude.

1852	conformed with that of	Triers	.....	$49^{\circ} 46'$	N. lat.
1853	"	"	Paris	.....	$48 50$ "
1854	"	"	Constantinople again.		
1855	"	"	Vienna	.....	$48 13$ "

The spring is remarkable for its uniform mean temperature, and its greatest range of thermometer, its sudden increasing

warmth, the greatest quantity of rain, and the least relative humidity.

The periods of last frozen dew and the last snow in the different years were as follows :

1851,	last frozen dew,	May 7 ;	last snow,	March 9.
1852,	“	“ May 21 ;	“	April 1.
1853,	“	“ May 20 ;	“	March 23.
1854,	“	“ April 18 ;	“	April 29.
1855,	“	“ May 11 ;	“	March 28.

In the afternoon, at 2 P. M., the air is generally 14 degrees Fahr. warmer than in the morning, and 11 degrees than in the evening.

S U M M E R .

While our winters conform to the winter of places in Europe in 50° N. latitude, and our springs with the springs of the same country in 45° N. latitude, our summer approaches more or less the summer in Europe in the same latitude. The mean temperature of our summer generally conforms with the summer of Padua, Italy. Especially the summer of 1851 was conformed with the summer of Sevastopol, 44° 36'.

1852 with the summer of	Vienna	.....	48° 13' N. lat.
1853	“	Constantinople	 41 00 “
1854	“	Naples	 40 51 “
“	“	Algiers	 36 47 “
“	“	Las Palmas	 28 00 “
1855	“	Lisbon	 38 42 “

Besides this, the summer is distinguished by the least range between the extremes of the barometer and thermometer, its greatest amount of absolute humidity, the least cloudiness, and the most thunder storms. At 2 P. M. the air is generally 15 degrees Fahr. warmer than in the morning, and 13 degrees than in the evening.

A U T U M N.

Our autumn brings us back in the northern latitude of 44 and 51 deg. Its mean temperature is about conformed with that of our spring, but the whole season is made more pleasant by its fair days and less rain, although its relative humidity is much greater than in the spring. Its sudden declining in temperature, from month to month, is not so sensibly felt as it looks by the degrees, because it is more a gradual declination from day to day, and never so great a difference between the mean temperature from day to day as the spring season presents.

The periods of the first frozen dew and the first snow in different years were as follows :

1851,	first frozen dew,	Sept. 25 ;	first snow,	Oct. 26.
1852,	“ “	Sept. 13 ;	“	Nov. 13.
1853,	“ “	Oct. 3 ;	“	Nov. 9.
1854,	“ “	Oct. 5 ;	“	Nov. 18.
1855,	“ “	Oct. 7 ;	“	Oct. 23.

At 2 P. M. the air is generally 15 degrees Fahr. warmer than in the morning, and 11 degrees than in the evening.

In comparison with other places, its mean temperature is generally conformed with the mean temperature of the autumn of La Rochelle, in France. Especially the autumn of 1851 was conformed with the autumn of London, 51° 31' N. latitude.

1852	with the autumn of	Paris	48° 50' N. lat.
1853	“ “	London again.	
1854	“ “	Sevastopol	44 36 “
1855	“ “	Sevastopol again, but not quite so warm.	

W I N T E R O F 1855, '56.

This interesting winter commenced with fair days, then rain set in, snow followed, and on the 11th of December, 1855, the ground was covered with snow. Again fair weather for a few days, then rain; fair weather again for some days; rain and

snow again, and the snow which fell in the night between the 24th and 25th, covered the earth, and is still visible in March, 1856. The first severe frost took place December 26th, eight degrees below zero. The minimum of the month was -9.40° , the maximum 53.37° , and the mean temperature of the month, 29.30° Fahr. For one day the mean temperature was below zero.

The whole month of January, 1856, was distinguished by fair days and about equally cold weather. The highest temperature of the month was only 41.22 degrees, and the lowest one 26.05 degrees Fahr., below zero. The mean temperature of the month was 15.35 deg. Fahr.; for four days the mean temperature was below zero, and only on one day the mean temperature reached 29.75 deg. Fahr.

The month of February shows more unpleasant days, and was very cold, especially the first nine days. In the morning of the 4th of February the lowest temperature took place, being -31.45 deg., and the highest one on the 26th of the month, amounting to 52.25 deg. Fahr. The whole month was also not very changeable in its temperature; for four days the mean temperature was below zero, and only on one day the mean temperature reached 39.65 deg. Fahr.

The mean stand of the barometer was, for the whole season, nearly the same as generally; also its range.

The mean temperature of the *whole winter season* was 21.87 degrees Fahr., 8.70 degrees colder than generally, or six degrees colder than the winter in Warsaw, Poland, or about nine degrees colder than the winter in Berlin, Prussia, and only five degrees warmer than the winter in Petersburg, capital of Russia.

There fell much more snow than generally, but the amount of melted snow and rain together was much less than generally; the perpendicular depth of both was about three inches less, reaching only 6.274 English inches.

The force of vapor was 0.1066 inches less, but the relative humidity amounted to four per cent. more than usual.

It is remarkable that during the whole season easterly winds prevailed in place of westerly winds. The wind from north and

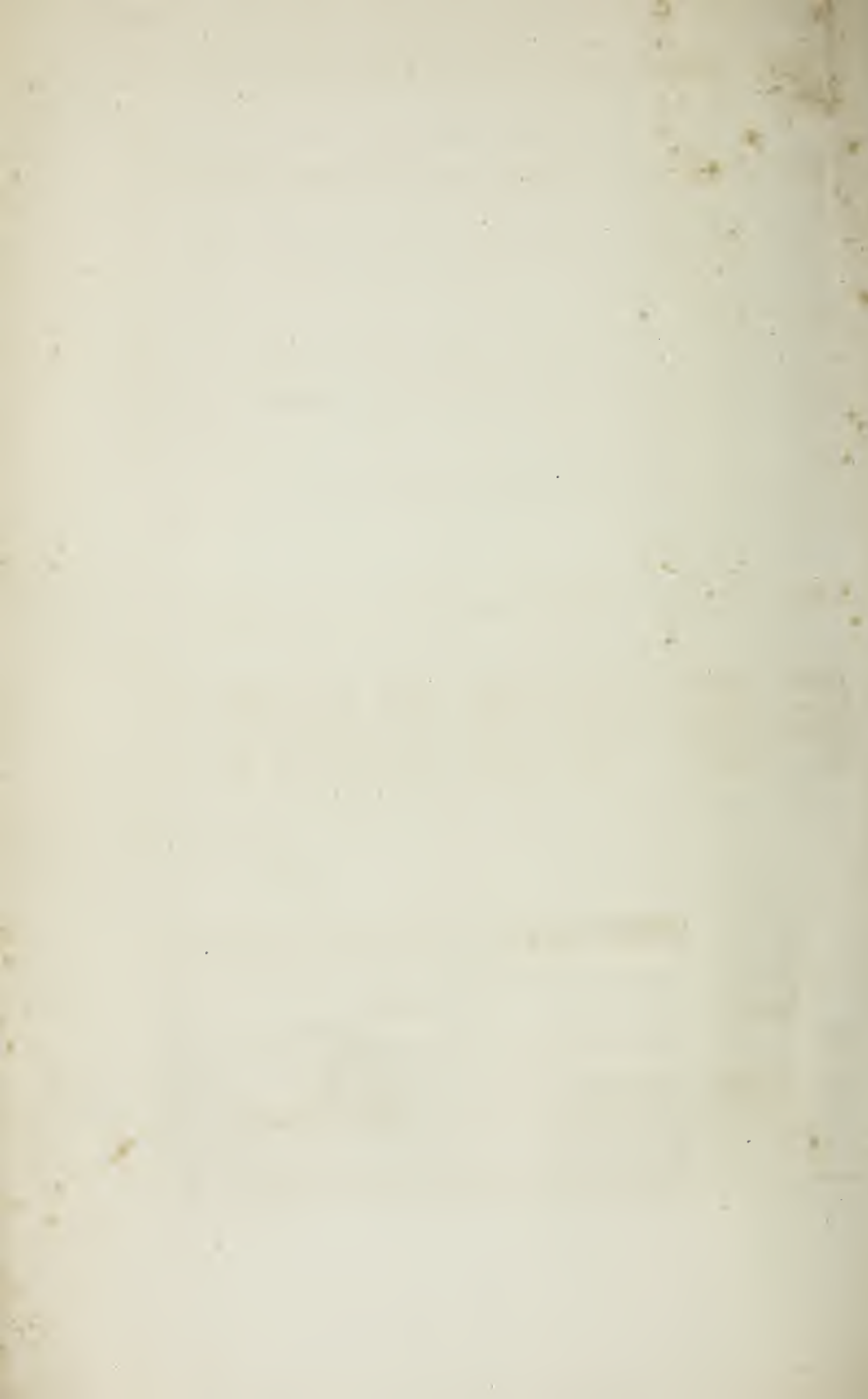
south blown in the proportion of 1 to 2, as generally is the case in this season, but the wind from east and west bore the proportion of 1 to 0.99, therefore the westerly wind blew six times less than usual.

The 9th of January was the coldest day, its mean temperature was -14.12 degrees Fahr., or -20.50 degrees Reaumur, and this day was 0.45 degrees Fahr. colder than the 19th of January, 1852. The warmest day of the season was December 14th, its mean temperature reaching only 49.10 degrees Fahr., or 7.63 degrees Reaumur.

The minimum of the whole season was, on the 4th of February, corresponding with the minimum of the 20th of January, 1852, to -31.45 deg. Fahr., or -28.2 deg. Reaumur; and the maximum amounted, on December 14th, only to 53.37 deg. Fahr., or 9.5 deg. Reaumur.

In fact, no fruit could ripen, no leaf could grow.

MARCH 3, 1856.



1.145			46.53	58.06	48.18	86	62	85
1.393	584.90	20	23.97	33.35	27.05	89	71	85
1.190	1078.95	4	45.42	59.45	47.07	76	46	75
0.933	2325.60	0	67.77	78.42	67.55	87	65	89
1.03	1648.05	1	48.95	61.02	51.05	91	67	89

LDEST DAY.

	Range.	c.	Date.
...	..1.714	.....	.....19th July.
...	95.39	.....	.....26th February.
...	42.4	.....	

TABLE V.

METEOROLOGICAL OBSERVATIONS,

MADE AT GERMANTOWN, MONTGOMERY COUNTY, OHIO.

FOR THE METEOROLOGICAL YEAR 1854-'55, BY L. GRONEWEG.

	BAROMETER. Corrected and reduced to the Freezing Point, or 32 deg. Fahrenheit, English Inches.				Open Air Thermometer, Fahrenheit.				Clear- ness of the Sky. Month- ly Means.	Wind, Directions, Monthly means.	Quantity of Rain and Melted Snow. Paris Cubic Inch.		Perpendicular depth of Rain and Melted Snow.		Rela- tive Humid- ity. M'th- ly m's Per cent.	Force of Vapor. Monthly Means.		No. thunder storms.	Number of Days, with							Mean Temperature.			Relative Hu- midity. Per cent.		
	Monthly Means.	Maximum.	Minimum.	Vari- ations.	Monthly Means.	Maximum.	Minimum.	Vari- ations.			Rain.	Melted Snow.	Paris Inches.	English Inches.		Paris Lines.	English Inches.		Heat Light- nings.	Dew.	Froz'n Dew.	Dry Mist.	Fog & Mist.	Rain.	Snow.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
1854. December, 1855.	29.240	29.568	28.733	0.835	31.55	55.17	5.22	49.95	6.33	E: W=1: 6.167. N: S=1: 1.070	179.30	12.90	1.245	1.327	82	1.717	0.151	0	0	0	10	4	4	7	5	27.95	36.72	29.97	87	69	90
January, .	29.222	29.968	28.254	1.714	29.97	61.47	0.50	60.97	7.36	E: W=1: 3.83. N: S=1: 2.190	281.20	286.95	3.945	4.205	81	1.631	0.142	0	0	0	4	0	4	6	7	26.15	35.37	29.30	90	72	82
February, .	29.240	29.710	28.707	1.003	22.55	46.17	-1.97	48.14	7.00	E: W=1: 3.21. N: S=1: 0.923	124.40	68.90	1.343	1.432	82	1.152	0.107	0	0	0	3	1	1	4	8	17.82	27.95	21.87	91	71	83
March, . .	29.186	29.764	28.493	1.271	34.02	56.30	5.00	51.30	6.05	E: W=1: 5.50. N: S=1: 1.29	425.40	56.30	3.345	3.566	71	1.693	0.151	2	1	0	5	6	2	8	4	29.52	40.10	32.67	82	54	76
April, . . .	29.293	29.675	29.000	0.675	56.07	90.95	19.40	71.55	4.97	E: W=1: 4.08. N: S=1: 1.55	309.65	0.00	2.150	2.292	62	3.163	0.284	2	1	7	4	11	2	5	0	49.32	65.97	51.12	72	40	73
May, . . .	29.302	29.479	28.795	0.684	62.37	90.27	30.20	60.07	5.42	E: W=1: 0.886. N: S=1: 0.726	343.90	0.00	2.388	2.546	66	4.157	0.373	6	2	14	3	5	0	9	0	57.42	72.27	57.42	74	45	77
June, . . .	29.124	29.391	28.751	0.640	67.10	90.95	40.77	50.18	6.27	E: W=1: 2.533. N: S=1: 0.700	938.65	0.00	6.518	6.947	79	6.018	0.533	11	6	8	0	0	5	20	0	64.17	74.30	63.05	85	63	87
July, . . .	29.213	29.479	29.009	0.470	75.20	93.42	53.37	40.05	5.33	E: W=1: 42.00. N: S=1: 1.353	703.45	0.00	4.885	5.206	79	7.695	0.693	13	7	14	0	0	6	18	0	72.05	82.17	71.37	87	63	87
August, . .	29.257	29.550	29.017	0.533	71.15	89.37	45.05	44.32	5.13	E: W=1: 5.727. N: S=1: 0.845	683.50	0.00	4.746	5.058	84	7.273	0.657	6	2	17	0	0	9	12	0	67.10	78.80	68.22	89	68	94
September, .	29.275	29.426	28.991	0.435	68.22	85.55	41.45	44.10	6.44	E: W=1: 2.037. N: S=1: 1.297	629.55	0.00	4.372	4.661	87	6.912	0.616	8	3	11	0	1	9	18	0	65.52	74.75	65.30	93	74	93
October, . .	29.213	29.435	28.911	0.524	48.20	72.95	25.25	47.70	4.70	E: W=1: 15.200. N: S=1: 0.928	170.10	4.50	1.213	1.293	79	3.014	0.266	0	0	4	10	4	7	8	1	41.22	58.32	45.27	91	57	88
November, .	29.266	29.666	28.787	0.879	44.37	72.50	19.40	53.10	6.60	E: W=1: 3.56. N: S=1: 0.855	848.40	0.00	5.8916	6.281	81	2.822	0.249	0	0	0	7	1	7	13	0	40.10	50.00	42.57	89	69	85
Sums, . . .											5637.50	429.55	42.042	44.817				48	22	75	46	33	56	128	25						
Means of the Year, . .	29.2359				50.898				5.97	E: W=1: 7.895. N: S=1: 1.145					78	3.937	0.346									46.53	58.06	48.18	86	62	85
SEASONS.																															
Winter, . .	29.234	29.968	28.254	1.714	28.02	61.47	-1.97	63.44	6.90	E: W=1: 4.403. N: S=1: 1.393	584.90	368.75	6.533	6.964	82	1.500	0.1332	0	0	0	17	5	9	17	20	23.97	33.35	27.05	89	71	85
Spring, . .	29.260	29.764	28.493	1.271	50.82	90.95	5.00	85.95	5.48	E: W=1: 3.470. N: S=1: 1.190	1078.95	56.30	7.883	8.404	66	3.004	0.2664	10	4	21	12	22	4	22	4	45.42	59.45	47.07	76	46	75
Summer, . .	29.198	29.550	28.751	0.799	71.15	93.42	40.77	52.65	5.58	E: W=1: 16.753. N: S=1: 0.933	2325.60	0.00	16.149	17.211	81	6.995	0.5951	30	15	39	0	0	20	50	0	67.77	78.42	67.55	87	65	89
Autumn, . .	29.251	29.666	28.787	0.879	53.60	85.55	19.40	66.15	5.91	E: W=1: 6.933. N: S=1: 1.03	1648.05	4.50	11.477	12.235	82	4.249	0.3730	8	3	15	17	6	23	39	1	48.95	61.02	51.05	91	67	89

YEARLY EXTREMES.

	Maximum.	Date.	Minimum.	Date.	Range.
Barometer—English Inches	29.968	8th January, 1855	28.254	21st January	1.714
Thermometer—Fahrenheit	93.42	19th July	— 1.97	26th February	95.39
Thermometer—Reaumur	27.3	"	—15.1	"	42.4

MEAN TEMPERATURE OF THE WARMEST AND COLDEST DAY.

	Fahrenheit.	Reaumur.	Date.
Warmest day	84.65	23.4	19th July.
Coldest day	5.90	—11.6	26th February.
Range	78.75	35.0	

273.26	8.876	9.462
36.09	10.091	10.757
0.00	9.408	10.029
47.82	8.096	8.630

29.27	87	68	83
48.55	80	51	75
67.89	86	55	85
49.97	90	61	86

MEAN

Date.

Coldest day	19th January, 1852.
Warmest day	30th July, 1854.
Range	

CLIMATE OF MONTGOMERY COUNTY, OHIO.

THE MEAN OF FIVE YEARS' OBSERVATIONS, MADE AT GERMANTOWN, FROM DECEMBER, 1850, TO DECEMBER, 1855. BY L. GRONEWEG.

LATITUDE, 39° 30' N. LONGITUDE, 81° 10' W. HEIGHT OF STATION ABOVE THE SEA, 720 FEET.

	BAROMETRIC.				Open Air Thermometer, Fahrenheit.				Clear- ness of the Sky. Mean of the Month.	Wind, Directions, mean of the Month.	Quantity of Rain and Melted Snow.		Perpendicular depth of Rain and Melted Snow.		Rela- tive Hu- midity. Mean of the Month. Per cent.	Force of Vapor.		No. thunder storms. Mean of the Month.	Number of Days, (Mean of the Month), with										Mean Temperature.			Relative Hu- midity. Per cent.				
	Corrected and reduced to the Freezing Point, or 32 deg. Fahrenheit, English Inches.										Paris Cubic Inch. Mean of the Month.		Mean of the Month.																							
	Mean of the Month.	Maximum.	Minimum.	Range.	Mean of the Month.	Maximum.	Minimum.	Range.			Rain.	Melted Snow.	Paris Inches.	English Inches.		Paris Lines.	English Inches.		Heat Light nings.	Dew.	Frost Dew.	Dry Mist.	Fog & Mist.	Rain. Snow	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.						
December,	29.259	29.611	28.605	1.036	30.74	58.37	-0.72	59.09	6.66	E: W=1: 4.38. N: S=1: 2.29	371.25	60.28	2.997	3.195	81	1.685	0.1510	1	0	0	7	3	5	8	4	26.91	36.27	29.07	89	70	86					
January,	29.259	29.906	28.458	1.448	28.80	59.27	-8.81	68.08	6.54	E: W=1: 13.80. N: S=1: 2.13	203.74	127.66	2.301	2.453	79	1.510	0.1332	0	0	0	6	0	6	6	6	24.00	34.70	27.50	88	68	82					
February,	29.234	29.725	28.691	1.038	32.17	55.62	1.54	54.08	6.82	E: W=1: 3.68. N: S=1: 1.74	424.13	85.32	3.578	3.814	78	1.675	0.1510	1	0	0	5	2	5	7	5	27.46	37.98	31.23	85	67	81					
March,	29.191	29.672	28.616	1.056	40.19	70.20	11.05	59.15	5.97	E: W=1: 4.17. N: S=1: 1.50	418.93	26.74	3.082	3.285	71	2.091	0.1865	2	1	1	6	7	4	9	3	34.61	47.43	38.84	82	55	76					
April,	29.158	29.597	28.606	0.991	50.90	82.58	22.01	60.57	5.84	E: W=1: 2.62. N: S=1: 1.40	455.34	9.35	3.224	3.437	68	2.815	0.2487	5	2	4	5	7	4	11	1	44.60	59.58	48.17	79	49	74					
May,	29.215	29.485	28.808	0.677	61.88	87.21	28.55	58.66	5.37	E: W=1: 1.96. N: S=1: 3.01	545.14	0.00	3.785	4.035	69	4.297	0.3819	7	0	1	3	3	4	12	0	55.40	71.33	58.64	80	49	76					
June,	29.181	29.463	28.827	0.636	69.44	91.89	41.75	50.14	5.09	E: W=1: 2.93. N: S=1: 4.05	421.48	0.00	2.926	3.119	76	6.110	0.5418	10	5	15	0	1	4	12	0	64.31	78.53	65.70	85	56	85					
July,	29.215	29.433	28.991	0.442	74.07	94.10	48.33	45.77	4.39	E: W=1: 9.99. N: S=1: 1.68	527.12	0.00	3.665	3.907	74	6.905	0.6128	10	7	20	0	1	4	11	0	68.67	83.52	69.93	85	53	84					
August,	29.222	29.482	29.001	0.481	71.42	90.32	41.77	48.55	4.47	E: W=1: 2.93. N: S=1: 1.59	405.77	0.00	2.817	3.003	78	6.620	0.5862	6	4	19	0	3	10	10	0	65.05	81.32	68.04	89	57	87					
September,	29.275	29.552	28.932	0.620	65.91	90.72	36.00	54.72	4.90	E: W=1: 1.69. N: S=1: 1.95	329.75	0.00	2.289	2.440	80	5.745	0.5062	5	2	12	0	2	11	10	0	59.63	75.78	62.51	91	59	87					
October,	29.252	29.547	28.842	0.705	51.30	76.64	24.89	51.75	4.85	E: W=1: 4.80. N: S=1: 2.01	305.19	2.50	2.136	2.277	78	3.342	0.2931	1	0	7	9	5	10	8	0	43.65	61.74	48.47	91	57	87					
November,	29.250	29.698	28.767	0.931	40.52	71.55	18.86	52.69	6.96	E: W=1: 3.36. N: S=1: 1.36	485.52	45.32	3.671	3.913	80	2.361	0.2131	0	0	0	7	4	6	10	3	36.05	46.35	38.93	87	67	84					
Mean of the Year, . .	29.2257	29.906	28.458	1.448	51.442	94.10	-8.81	102.91	5.657	E: W=1: 4.696. N: S=1: 2.060	4957.31	357.17	36.944	38.878	76	3.763	0.3375	48	25	91	48	38	72	114	27	45.91	59.54	48.92	86	59	82					
Mean of the Winter, . .	29.251	29.906	28.458	1.448	30.57	59.27	-8.81	68.08	6.67	E: W=1: 7.29. N: S=1: 2.06	999.12	273.26	8.876	9.462	79	1.623	0.1421	1	0	0	18	5	16	21	15	26.32	36.32	29.27	87	68	83					
Spring, . .	29.188	29.672	28.616	1.056	51.22	87.21	11.05	76.16	5.73	E: W=1: 2.91. N: S=1: 1.98	1419.41	36.09	10.091	10.757	69	3.068	0.2753	15	6	7	14	14	12	32	4	44.87	59.45	48.55	80	51	75					
Summer, . .	29.206	29.482	28.827	0.655	71.64	94.10	41.75	52.35	4.65	E: W=1: 5.28. N: S=1: 2.43	1354.37	0.00	9.408	10.029	76	6.545	0.5773	26	15	54	0	3	18	33	0	66.01	81.12	67.89	86	55	85					
Autumn, . .	29.259	29.698	28.767	0.931	52.58	90.72	18.86	71.86	5.57	E: W=1: 3.28. N: S=1: 1.77	1120.46	47.82	8.096	8.630	79	3.816	0.3375	6	3	19	16	9	18	28	3	46.44	61.29	49.97	90	61	86					

EXTREMES WHICH OCCUR.

MEAN TEMPERATURE OF THE COLDEST AND WARMEST DAY.

	Maximum.	Date.	Minimum.	Date.	Range.		Fahrenheit.	Reaumur.	Date.
Barometer—English Inches	29.977	31st January, 1851	28.254	21st January, 1855	1.723	Coldest day	—13.67	—20.3	19th January, 1852.
Thermometer—Fahrenheit	99.72	4th September, 1854	—31.45	20th January, 1852	131.17	Warmest day	85.55	23.8	30th July, 1854.
Thermometer—Reaumur	30.1	"	—28.2	"	58.3	Range	99.22	44.1	

TABLE VII.

TABLE FOR COMPARISON.

HUMBOLDT'S "ASIE CENTRAL."

PLACE	Latitude.	Longitude of Paris.	Mean Temperature of the						
			Year.	Winter.	Spring.	Summer.	Autumn.	Coldest Month.	Warmest Month.
Canary Islands, Las Palmas	28.00 N.	17.51 W.	71.24	64.40	66.92	74.84	79.16	64.04	84.56
Gibraltar	36.07 N.	7.41 W.	64.22	56.84	63.14	72.86	61.04	56.66	74.30
Algiers	36.47 N.	0.43 W.	64.04	54.32	62.96	74.48	70.52	58.10	76.46
Lisbon	38.42 N.	11.29 W.	61.52	52.31	59.90	71.06	62.60	52.16	72.14
Naples	40.51 N.	11.55 E.	61.52	49.64	59.36	74.48	62.24	48.56	76.10
Constantinople	41.00 N.	26.39 E.	56.66	40.64	51.80	73.40	60.44		
Florence	43.47 N.	8.55 E.	59.54	44.24	58.46	75.20	60.26	41.54	77.36
Sevastopol	44.36 N.	31.12 E.	52.70	35.24	50.36	71.06	54.68	33.08	72.32
Venice	45.26 N.	10.0 E.	56.66	37.94	54.68	73.04	55.94	35.24	75.02
Padua	45.24 N.	9.32 E.	54.50	37.04	53.78	71.42	55.40	35.24	73.22
La Rochelle	46.09 N.	3.28 W.	52.88	39.56	51.08	66.92	52.70	37.22	68.36
Geneva	46.12 N.	3.49 E.	49.46	34.16	49.10	64.22	50.36	31.28	65.48
Paris	48.50 N.	0.0	51.44	37.94	50.54	64.58	52.16	35.24	66.02
Vienna	48.13 N.	14.3 E.	50.18	32.36	50.90	68.54	50.90	29.12	69.26
Triers	48.50 N.	4.18 E.	50.00	35.42	50.00	64.04	50.18	32.00	65.66
Augsburgh	48.22 N.	8.34 E.	46.22	30.74	46.94	61.88	46.76	25.16	63.50
Strasburg	48.35 N.	5.25 E.	49.64	33.98	50.00	64.58	50.00	31.28	65.84
Wurtzburg	49.48 N.	7.36 E.	50.18	34.88	50.36	65.66	49.46	30.38	67.28
Plymouth	50.22 N.	6.28 W.	51.98	44.42	50.18	60.80	53.06	42.62	61.88
London	51.31 N.	2.26 W.	50.72	39.56	49.10	62.78	51.26	37.40	64.04
Halle	51.31 N.	9.37 E.	47.84	32.00	47.48	63.50	48.38	27.86	66.74
Gottingen	51.32 N.	7.36 E.	48.38	33.08		63.68			
Warsaw	52.13 N.	18.42 E.	45.50	27.50	44.60	63.50	46.40	24.80	64.76
Berlin	52.31 N.	11.3 E.	47.48	30.56	46.40	63.14	47.84	27.68	64.40
Tilsit	55.04 N.	19.33 E.	44.06	25.52	42.62	62.06	45.14	22.28	63.50
Upsal	59.52 N.	15.18 E.	41.36	25.34	38.12	59.19	43.16	23.18	61.34
Moscow	55.45 N.	35.18 E.	38.48	13.46	43.34	62.24	34.88	12.92	63.68
Petersburgh	59.56 N.	27.59 E.	38.30	16.88	35.06	60.26	40.46	13.46	62.42
Germantown, Ohio	39.30 N.	86.36 W.	51.44	30.57	51.22	71.64	52.58	28.76	74.12
January, 1856								15.35	
Albany, N. Y.	42.39 N.	76.05 W.	48.56	26.60	47.66	69.62	49.46	24.98	71.96
Boston, Massachusetts	42.21 N.	73.24 W.	48.74	29.12	45.86	68.99	50.72	26.06	71.24
Baltimore, Maryland	39.17 N.	78.58 W.	52.88	32.72	50.72	73.58	55.22	30.92	75.20
Athens, Menard county, Illinois ..			53.07	31.07	53.78	73.33	54.41	25.55	77.91
San Francisco, California			56.57	49.67	55.84	59.64	59.92	49.31	62.21





3 0112 072669853